

Research Report
UKTRP-84-28

JACKSON PURCHASE PARKWAY PAVEMENT STUDY

by

James H. Havens
Associate Director

Kentucky Transportation Research Program
College of Engineering
University of Kentucky

in cooperation with
Transportation Cabinet
Commonwealth of Kentucky

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16. Abstract <p>Four distinct patterns of cracking were found. Temperature cracks are transverse and occur at intervals of about 15 to 88 feet. Roller-induced cracking has been made apparent by weather and erosion. Longitudinal cracking is usually at the edges of the wheelpaths where rutting is prominent. Map cracking or checkering in the wheel paths is caused by the maximum shear stresses occurring at a depth equal to 1/3rd the radius of the loaded area (tire print). This cracking penetrated about 2.5 inches. This cracking and weakness was found only in the all-gravel asphaltic concrete. No stripping was found, but evidences of weakness were discernible. Where gravels (partially crushed) were blended with crushed limestone, these defects in performance were not found.</p> <p>Overlay requirements were determined by analysis of Road Rater deflections.</p>					
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PROJECT CHRONOLOGY AND LAYOUT

The Jackson Purchase Parkway was conceived as a principal highway from the southwest, through Memphis, connecting with the West Kentucky Parkway and onward to the east coast. It was completed in 1968. Tennessee did not carry forward a plan for a modern facility to Fulton. The Fulton bypass remained a dead end for a long time after the Parkway was completed. Traffic developed slowly, and revenues lagged severely.

In 1966, a somewhat hurried study of the geology, stratigraphy, and occurrences of gravels and soils of the Purchase area was completed (1). Roadway plans proceeded concurrently. Limestone aggregate was used within economical haul distance from Kentucky Dam. Cement-treated bank gravel base was used throughout. A large pit at Hickory was the principal source. South of Bayou du Chien, the gravel came from pits operated by McDade's and Ken-Tenn's combine. North of Mayfield Creek, the asphaltic concrete base utilized limestone; limestone coarse aggregate along with skid-resistant fine aggregate was used in the surface. From Mayfield Creek southward, the asphaltic concrete base and surface were composed of two-thirds (approximately) crushed gravel (principally from Ingram Materials at Columbus, dredged) and one-third crushed limestone. South of Bayou du Chien, the asphaltic concrete base and surface were composed solely of crushed gravels. The Mayfield bypass and the Fulton bypass are toll-free. Part of the Mayfield bypass incorporated some 1962 construction. The 1962 pavement consisted of 11 inches of dense-graded aggregate, 5 inches of asphaltic concrete base, and 1.5 inches of asphaltic concrete surface, and dense-graded aggregate shoulders. On the northbound side, this runs from 1,500 feet south of the US-45 interchange to Mayfield Creek. On the southbound side, it runs from 1,500 feet south of US 45 to the end of the bypass. Otherwise, the typical section consisted of 13 inches of cement-treated gravel base, 5 inches of asphaltic concrete base, and 1.5 inches of asphaltic concrete surface. The shoulders consisted of 4 inches of untreated gravel, 4 inches of cement-treated gravel base, and 2 inches of asphaltic concrete surface. A section on the Fulton bypass that was excavated and exposed during this investigation measured only 5.5 inches of asphaltic concrete base and surface (1 inch less than design thickness). Figure 1 is a layout map of the entire project.

A random pattern of hairline cracks was discovered within two years after construction. Those were predominately of the type here attributed to roller action at the time of construction. Perhaps some temperature contraction and shrinkage (tension) cracking was involved.

The pavement lay more-or-less dormant for more than 12 years. Some paver-laid patches ensued; a mile length of the outside southbound lane in the all-gravel section was milled and overlaid, and the entire Mayfield bypass was resurfaced in 1984. Wheelpath cracking in the all-gravel section was first reported in 1981 by consulting engineers retained to conduct annual inspections (2) (APPENDIX I).

A memorandum report of condition and overlay requirements was submitted July 24, 1984 (3) (see APPENDIX II). In conference, reviewers were advised that, to know more about the interior of the pavement and the nature of the distress, it would be necessary to trench across the outer lane and expose a complete cross section for inspection. Department engineers elected to pursue that course of action. Four sites were

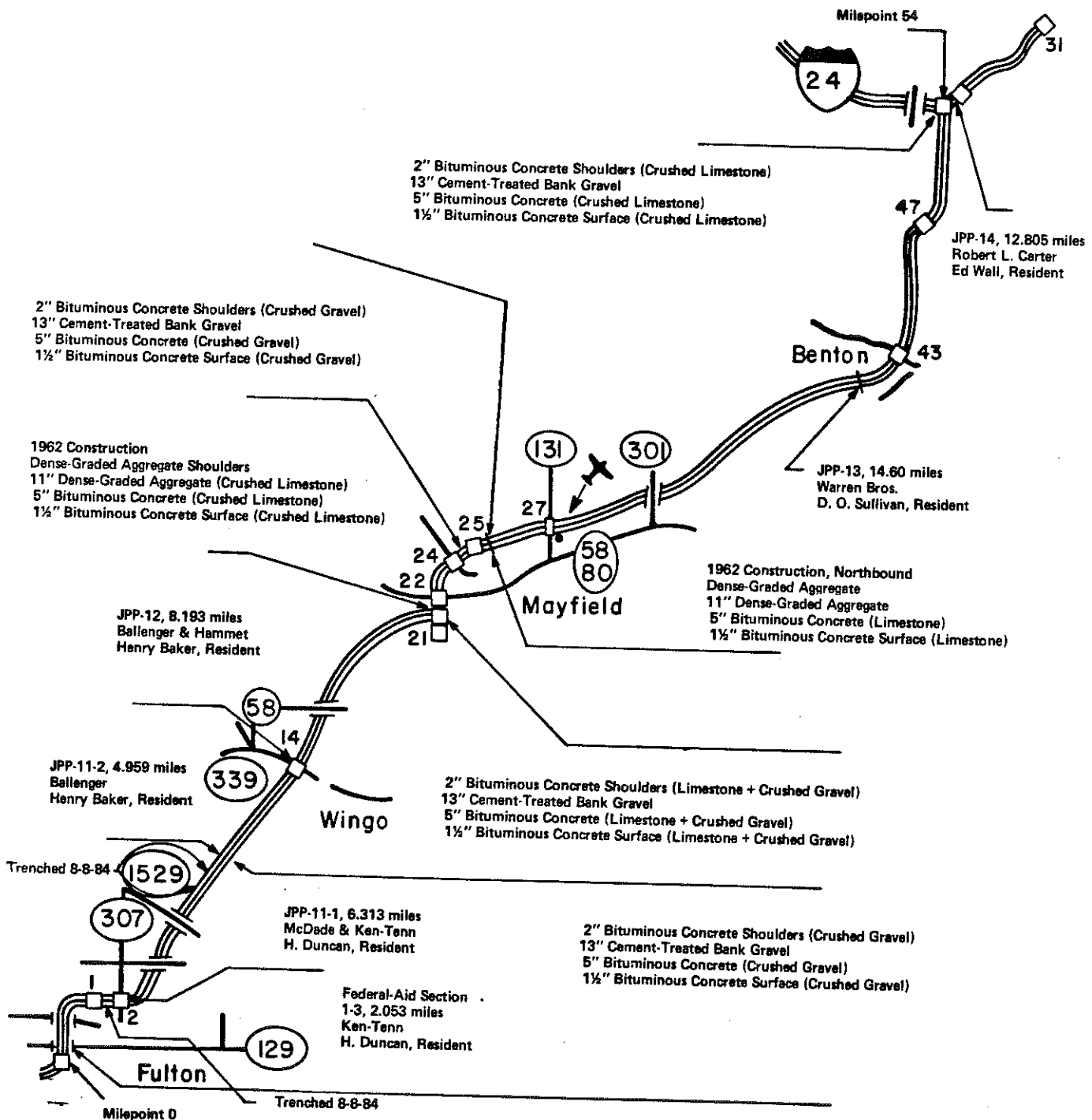


Figure 1. Layout Map of Jackson Purchase Parkway Showing Design Sections, Contractors, and Resident Engineers.

excavated. A memorandum report was submitted August 13, 1984 (4) (See APPENDIX III).

This report further documents the development of the case study and the findings, conclusions, and remedies that evolved. This report presents analyses of pavement performance, nature of materials, and pavement design and management in general.

OVERVIEW

CRACKING AND RUTTING

Four distinct patterns of cracking were observed on the Parkway. They are illustrated by Figure 2. Only that pattern identified as wheelpath cracking was unique to the all-gravel section south of Bayou du Chien (Graves-Fulton County line). The other three patterns persist throughout the Parkway and are likely to be found in many, if not all, asphaltic concrete pavements of some age in any part of the state. Further description follows.

Occurrences of rutting have not been limited to pavements containing gravel aggregate. Mechanisms of rutting and causes have been under study for more than ten years. Severe rutting has been associated with intense heavy truck traffic and with tenderness and lack of stability of asphaltic concrete mixtures (5, 6, 7).

Temperature Cracking

When an elastic material shrinks or contracts due to cooling, the shortening movements generally encounter only nominal external resistance. However, if a bar or rod is held fixed at the ends and is cooled, a state of virtual strain develops and a state of virtual stress exists in the member. A pavement without joints may be viewed as a bar laying on the earth and restrained from contraction by cumulative friction ($F = fW = f \times \text{length} (L) \times \text{width} (w) \times \text{depth} (d) \times \text{unit weight} (u) = \sigma A$). When f , the coefficient of friction, = 1, $\sigma A = L \times w \times d \times u$. Since $A = w \times d$,

$$\sigma = L \times u. \quad (1)$$

Inasmuch as L is the distance from a free end and inasmuch as the resistance F must be balanced, it follows that a length $2L$ is the shortest that would allow the bar to crack at the midpoint (σ = critical stress). The stress also can be expressed as

$$\sigma = (\Delta T / 2) \times C_t \times E. \quad (2)$$

The coefficient of temperature contraction C_t is largely determined by the aggregate and is approximately 1×10^{-6} per degree Fahrenheit. The modulus of elasticity E approaches a constant at 34°F of approximately 5×10^6 psi. The temperature change ΔT affecting cracking is $95^\circ\text{F} - 35^\circ\text{F}$ or 60°F .

The tensile strength of asphalts approach a value of 30 psi at 30°F to 34°F . The crack interval is slightly less than $2L$. If the tensile strength is 30 psi, the average minimum crack interval will not exceed 60 feet (88 cracks per mile).

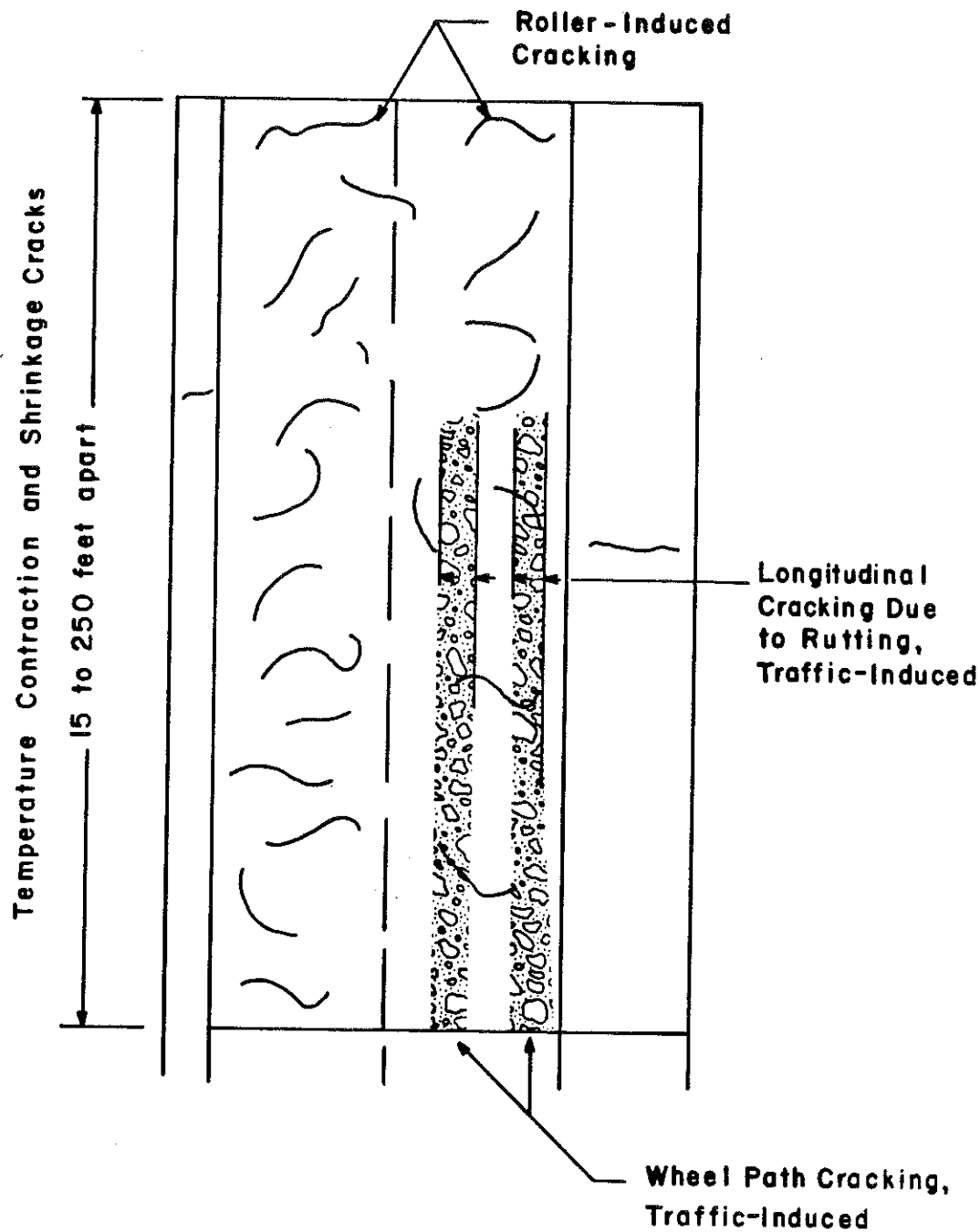


Figure 2. Four Distinct Patterns of Cracking on Jackson Purchase Parkway. Only wheel path cracking was unique there, and it was limited to the all-gravel section south of the Graves-Fulton County line.

Roller-Induced Cracking

Excessive rolling is known to damage pavement layers. Knowing when to stop rolling is important. Knowing when to do rolling and when to delay rolling or do back-rolling is important too. When a steel-wheel roller "walks out on top" or when there is no further "seating" of the mat behind the roller wheel, compaction ceases. Sponginess underneath the wheel will cause close-spaced cracking. Shoving (creeping) ahead or laterally tends to induce fine but large arcing cracks that may escape detection. Such cracks are unlikely to heal and will surely become obvious as time lapses (erosion and weathering). There have been several rather classical cases of this type of occurrence. I 64 in Clark and Montgomery Counties was overlaid to hide the cracks and smooth the wheelpaths (ruts). That overlay is currently being milled off and replaced. The original decision to overlay there was based on cores taken mostly across temperature cracks. They extended full depth. The random cracking hardly penetrated below the surface course.

Roller-induced cracking is illustrated in Figure 2. It occurs not only south of Bayou du Chien but northward also -- nor does it stop at the north end of the Parkway. It may beset many asphalt surfaces not otherwise suspect. It occurs (with other cracking) on KY 676, on the west side of the river, at Frankfort. Intense cracking of this type has been observed on KY 627 from Boonesborough toward Winchester.

Rutting

Rutting is the recognized performance defect in asphaltic concrete pavements that foretells of further defects that may arise. One is longitudinal cracking along edges of the wheelpaths and perhaps along the middle of the wheelpath. A later stage is map cracking or blocking out within the wheelpath. The blocking out is probably more indicative of deep structural failure. Shallow map cracking is indicative of shearing actions associated with advancement and progress of rutting. This would most likely be accompanied by upthrusting at edges of the wheelpath and the appearance of longitudinal cracks.

Wheelpath Cracking

The limiting strength of asphalt (cold) is approximately 30 psi. This is also the limit of bond (adhesive) of asphalt to aggregate. Stressing at temperatures below 34°F may induce fracture or loss of bond; stressing at warmer temperatures will surely induce yielding (elongation, flow). Some gravel particles exposed by tearing of cores and exposed by breakage of slabs during trench excavation appeared bare of asphalt coating but appeared oily. It is surmised that a phenomenon best described as syneresis occurred. Classical stripping (displacement of an adherent asphalt coating by water) was not observed. Of course, the asphalt that had coated the upper visible surface of the gravels at the top of the pavement had been worn (abraded) or stripped off long ago.

Stress within a pavement arises from tire forces. Therefore, they are most intense in the wheelpaths. The maximum shear stresses occur at a depth under a tire equal to one-third the radius of the tire print. Thus, the depth varies with load; and the lateral position varies randomly within the wheelpath. Shear stressing in warm weather may induce creep longitudinally ahead or rearward if tire traction is intense. In severe cases, this movement may progress several feet. Where braking is frequent

(at stop lights), shoving and rippling is common. This creeping should not be confused with slippage between construction layers. Some movement progresses laterally, and a slight heave (ridge) may form at the edge of the wheelpath. Sometimes a longitudinal crack will be formed at the inner or outer edge of the wheelpath; however, this crack may not extend more than 2 or 3 inches deep. Rutting may occur without showing any evidence of cracking.

Rounded particles may roll or tumble in their sockets without causing outward dilation (loss of density) or cavitation or other derangement of surrounding particles. Strength (shear) may never be as great after slippage as it was before movement occurred.

GRAVELS IN ASPHALTIC CONCRETE AND CEMENT-TREATED GRAVEL BASE

The pit gravels were altogether from Lafayette deposits. Those from Hickory were reddish and brown; those from the southern source were more yellowish and orange. They are all practically pure cherts. The brownish and reddish gravels have become filled with iron oxides and are less porous and are more durable from the standpoint of saturation and freezing. It has been speculated that these gravels may have originated in the Fort Payne chert beds. The Tuscaloosa is usually light gray or tan and is highly absorptive and is more rounded than the Lafayette. Occasionally the Lafayette is covered with 10 to 25 feet of loess. Sometimes a cleaner product has been obtained by dredging the gravel from a flooded pit or a pond.

Crushed gravel used in the asphaltic concrete base and surface was principally from Columbus and was dredged from the Mississippi River. SPR (Simplified Practice Recommendation) No. 8's were used in surface courses; No. 57's were used in bases. Some sand was manufactured by crushing gravel at Columbus. Sand produced there served otherwise in the Purchase Area as a skid-resistant aggregate in sand-type Class A surfaces and slurry seals.

Additional information from laboratory and field reports during construction is given in APPENDIX IV.

The Ohio River at Paducah is practically void of gravels larger than "pea" size.

It is inferable from the performance of the all-gravel asphaltic concretes south of Bayou du Chien (Graves-Fulton County line) that partially crushed gravels alone do not provide adequate stability and resistance to shear and creep. The section northward containing a blend of partially crushed gravels and crushed limestone have not, to this date, exhibited the type of weakness that has beset all-gravel sections. Stability remains a good measure of resistance to shear; however, the values sought should be high enough to preclude movement (creep).

In-blending limestone and sweetening with hydrated lime, together with high stability, will enable the continued use of local resources (gravels) in asphaltic mixtures. It was learned long ago that uncrushed gravels are unsuitable for asphaltic concretes (8, 9, 10, 11). The lower portion of the Parkway proves convincingly that partially crushed aggregate mixes are undependable. Hope lies in blending with crushed limestone. ☐

Confidence in cement-treated gravel bases has been restored and strengthened. Indeed, cement-treated bases utilizing sandstones and soil-cements have always given good performance. That history goes back to the 1920's and to uses by George Haley in Daviess County. Mr. Haley later was an Assistant State Highway Engineer.

The cement-treated gravel on the Purchase Parkway was viewed as a successful venture yielding great savings in costs of construction. Nothing has been found in this investigation that would diminish the highest regard for the base and for its further use throughout the area. It was, in fact, this project that inspired the use of cement-treated sandstone base on sections of KY 80, Hazard-Watergap.

Significant background information may be found in References 1, 11, 12, 13 and 14.

RESTRUCTURING PLAN

A restructuring plan was formulated expeditiously for the lower 2.478 miles and announced for letting September 21, 1984 (15). Features of the work and limits of the project are shown in Figures 3, 4, 5, 6, and 7. Successive projects will surely follow as funding permits. Eventually, the entire length of the Parkway will require overlayment. Roller-induced cracking is evident, and erosion will cause increasing roughness and perhaps some spalling due to freezing. Temperature cracking is more prominent in some sections but poses no immediate crisis. Rutting and longitudinal cracking seemed most prominent on the northern end. A long-range plan should be formulated for all of the mileage north of Bayou du Chien (Fulton-Graves County line) so proper funding can be provided as needed.

Structural analyses, together with the inspection of exposed cross sections of the pavement (3, 4) enabled a forthright resolution of the restructuring plan for the first project. That or a very similar plan would apply northward to the Fulton-Graves County line. Other plans, of course, were implemented during the current season on the Mayfield bypass.

It is recommended that straight transverse lines be sawed into the final surface to a depth of one-eighth inch at chosen locations in the outside lane to reveal any further movement of the pavement surface in the longitudinal directions.

Additional background information is summarized in APPENDICES V, VI, and VII.

REFERENCES

1. "A General Survey of Highway Construction Materials (Jackson Purchase Region)," R. C. Deen and J. H. Havens; Research Report 232, Kentucky Department of Highways, March 1966.
2. "Jackson Purchase Parkway, Inspection Report," American Engineering Co, 800 Corporate Drive, Lexington, Ky, December 1981, March 1983, and April 1984.
3. Letter to C. S. Layson, July 24, 1984, Re: Jackson Purchase Parkway: Pavement Condition Evaluation; by J. H. Havens with supplementary by G. W. Sharpe, July 27, Re: Deflection Analyses for Jackson Purchase Parkway, MP 0.00 to MP 8.34. (See APPENDIX II)

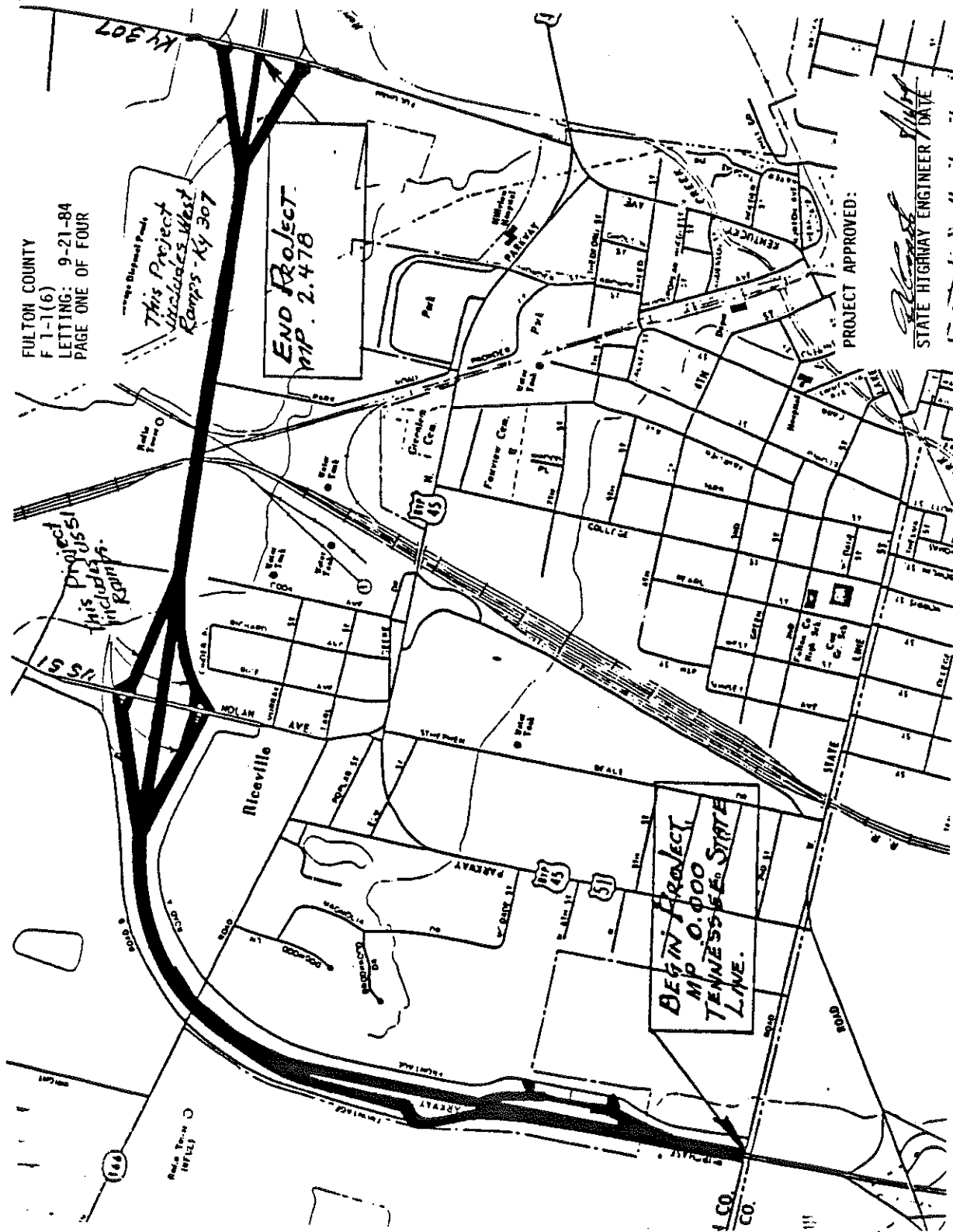
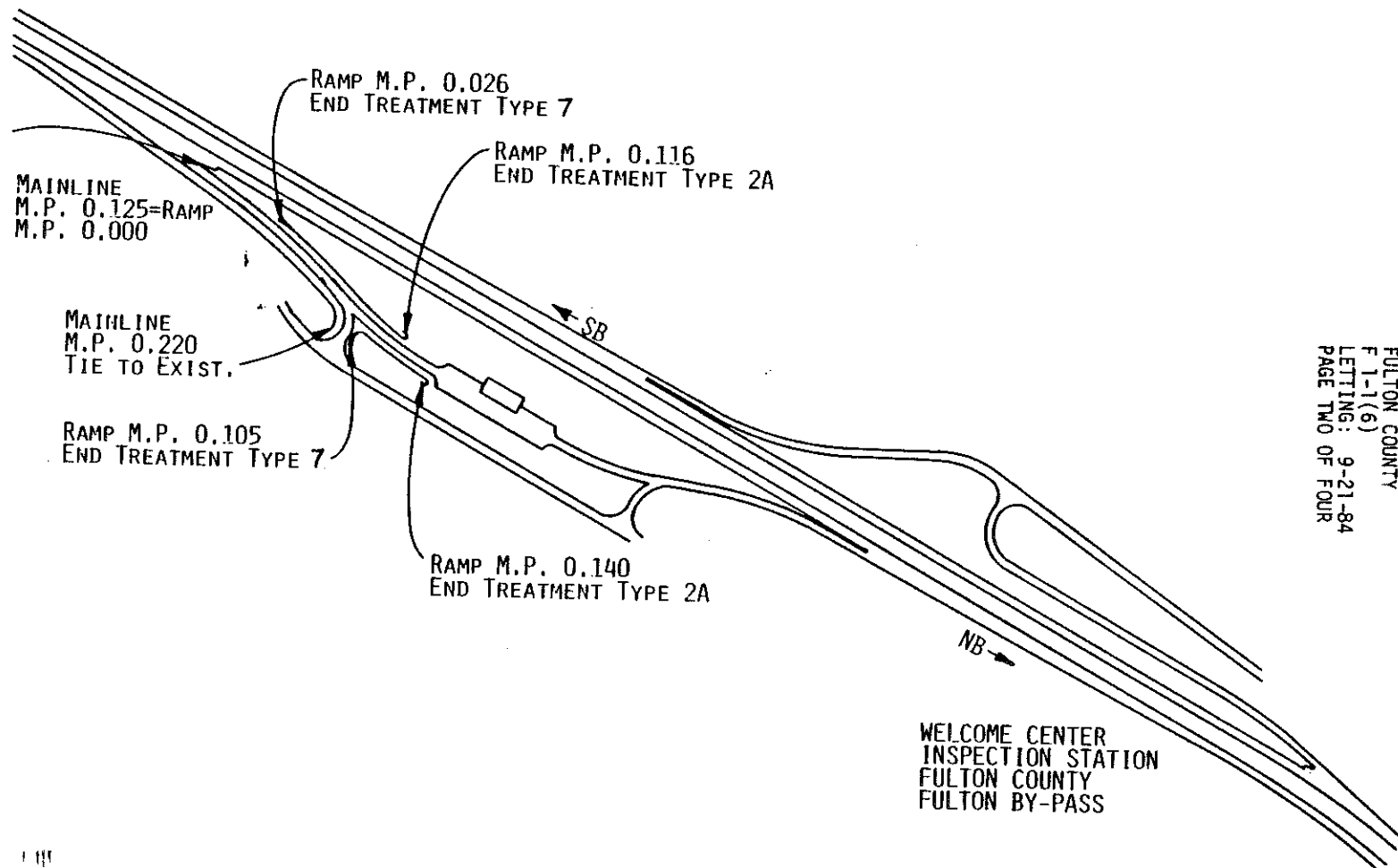


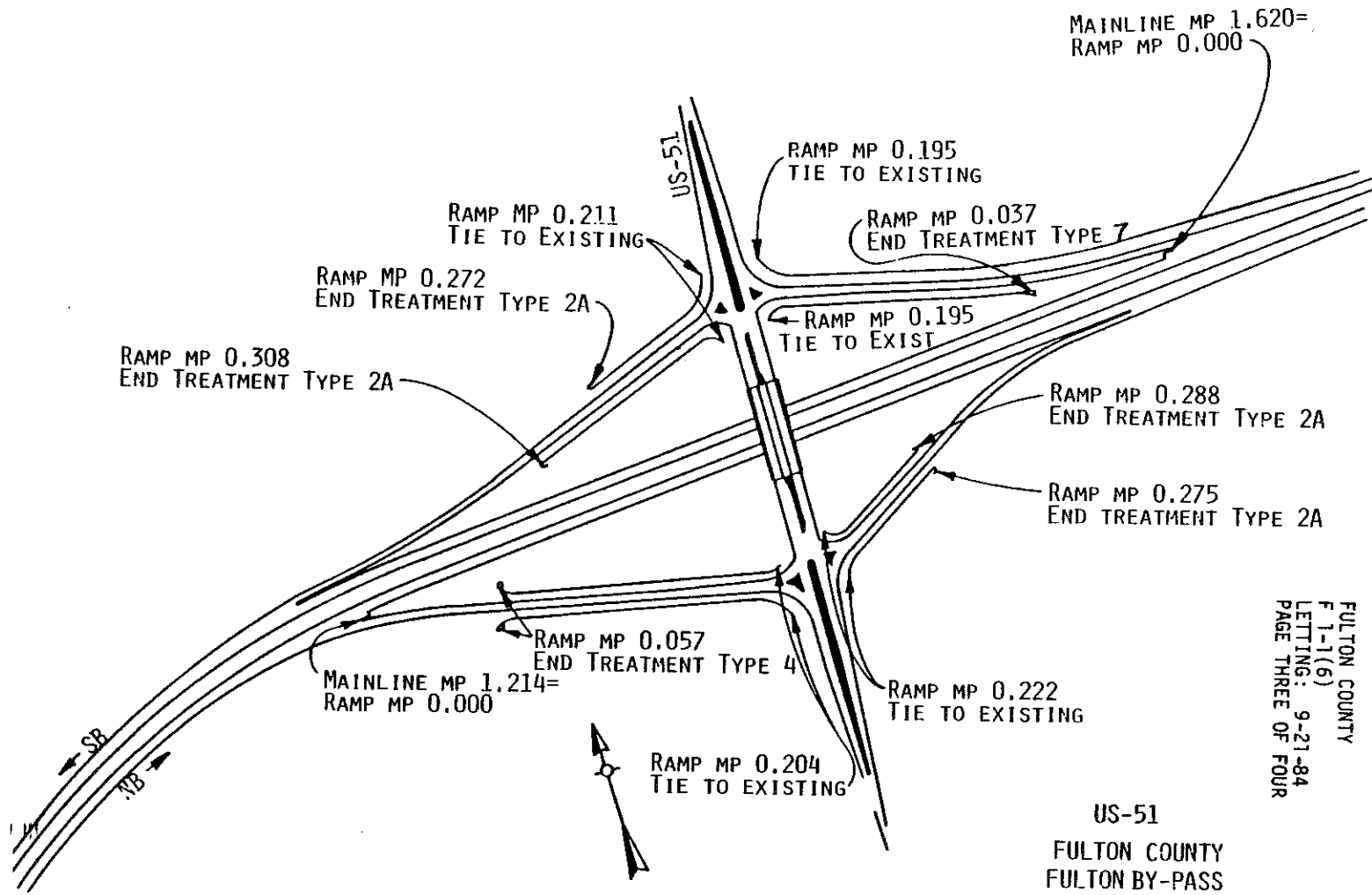
Figure 3. Rehabilitation Project Layout (15).

Figure 4. Ramp Details, Rehabilitation Project (15).



FULTON COUNTY
F 1-1(6)
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Figure 5. US 51 Interchange Details, Rehabilitation Project (15).



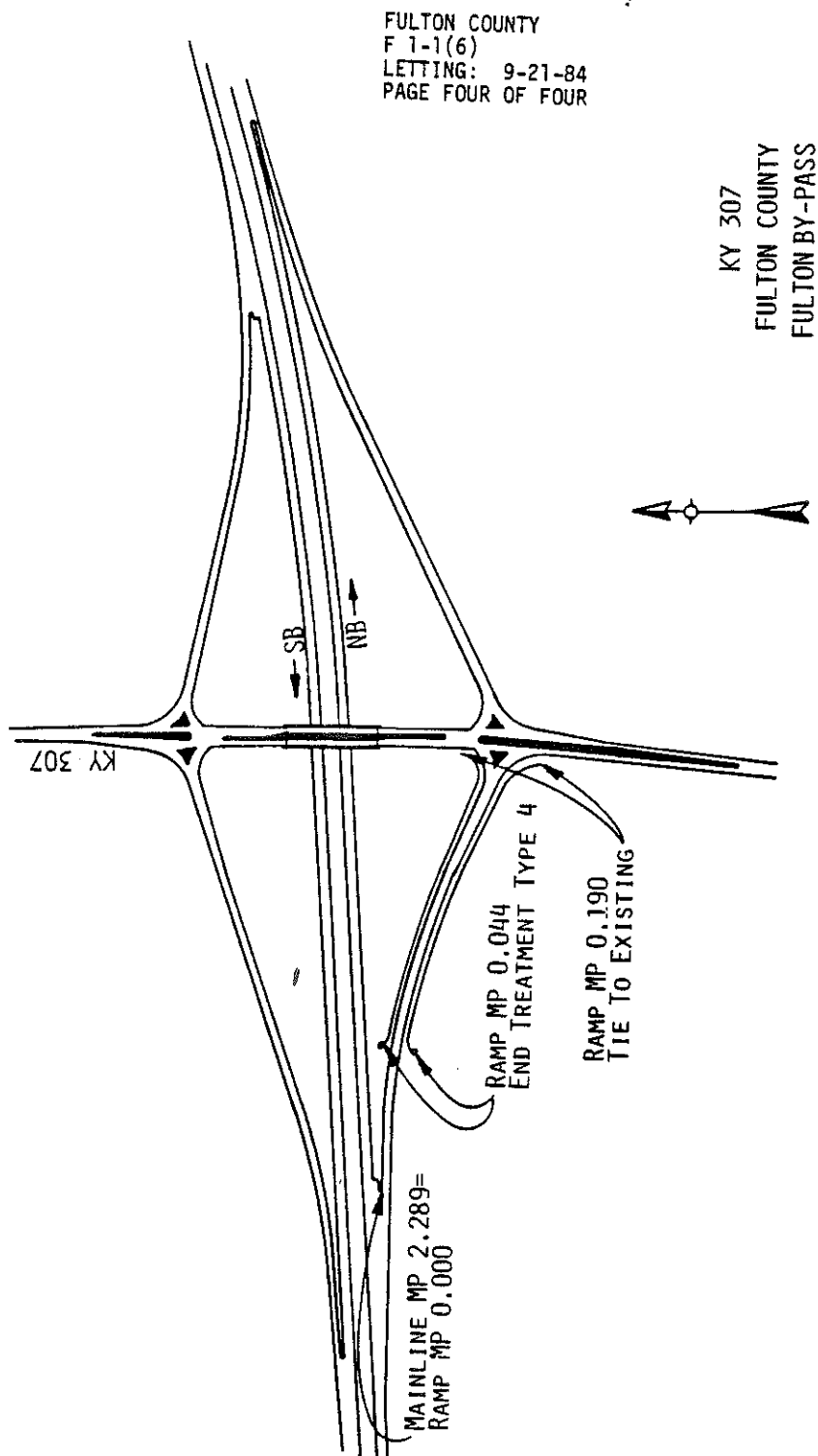
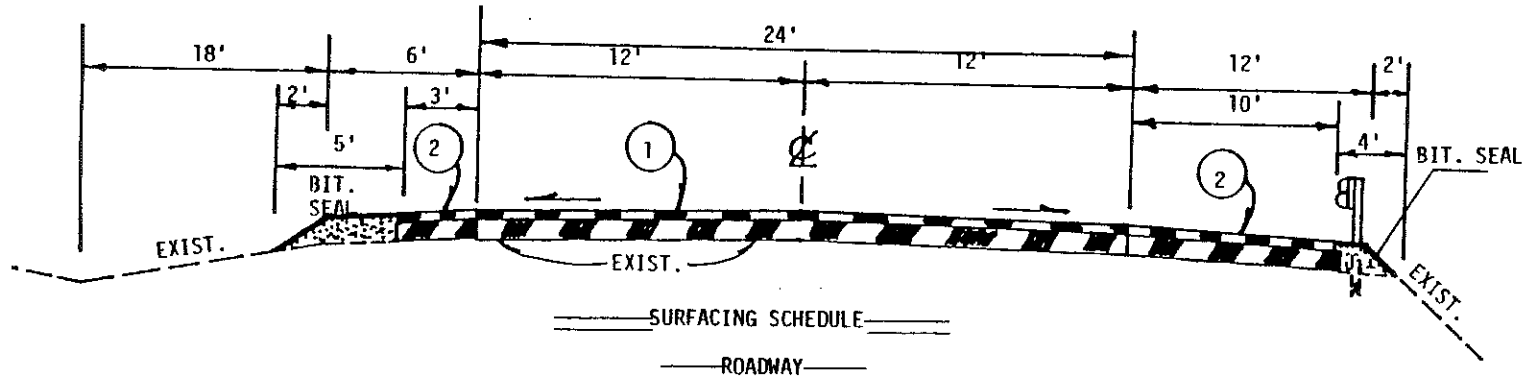


Figure 6. KY 307 Interchange Details, Rehabilitation Project (15).

Fulton County
F 1-1(6)

JACKSON PURCHASE PARKWAY
1/2 Typical Section



1/2" Bituminous Pavement Milling and Texturing Overall
Slurry Seal
0.8 Lb./S.Y. Bituminous Tack Coat (Over Existing and Between Each Course)
Approx. 2" Compacted Depth Bituminous Concrete Base
Approx. 1" Compacted Depth Bituminous Concrete Surface

SHOULDERS

Slurry Seal
Approximately 2" Bituminous Concrete Base
0.8 Lb./S.Y. Bituminous Tack Coat
Approximately 1" Bituminous Concrete Surface
Dense Graded Aggregate (Outside Edge)

BITUMINOUS SEAL COAT

2.4 Lbs./S.Y. Bituminous Seal Coat
20 Lbs./S.Y. Crushed Aggregate Size No. 8 or 9M
2.4 Lbs./S.Y. Bituminous Seal Coat
20 Lbs./S.Y. Crushed Aggregate Size No. 8 or 9M

TYPICAL SECTION
FULTON COUNTY
F 1-1(6)
LETTING: 9-21-84

Figure 7. Surfacing Schedule, Rehabilitation Project (15).

4. Letter to C. S. Layson, August 14, 1984, Re: Jackson Purchase Parkway: Pavement Condition Evaluation; by J. H. Havens with supplement by G. W. Sharpe, August 9, 1984, Re: Overlay Thickness Recommendations for Rehabilitation Activities -- Jackson Purchase Parkway, MP 0.00 to 8.34. (See APPENDIX III)
5. "A Computerized Analysis of Flexible Pavement Rutting Behavior (PAVRUT)," D. L. Allen; Research Report UKTRP-83-6, College of Engineering, University of Kentucky, February 1983.
6. "Rutting: A Case Study (US 23; 1.5 mi. North of Louisa)," J. H. Havens, G. W. Sharpe, D. L. Allen, and H. F. Southgate; Research Report UKTRP-83-1, College of Engineering, University of Kentucky, November 1983.
7. "Overlay Recommendations for I 64: Rowan, Carter, and Boyd Counties, Kentucky," G. W. Sharpe and H. F. Southgate; Research Report 551, Kentucky Bureau of Highways, August 1980.
8. "Memorandum Report of Observations on Bituminous Pavements Containing Uncrushed River Gravel," Research Report 78; Kentucky Department of Highways, May 1952.
9. "A Compendium on Class I, Type C Mixes," Research Report 85, E. G. Williams; Kentucky Department of Highways, December 1952.
10. "Class I Bituminous Mixtures," R. L. Florence; Research Report 239, Kentucky Department of Highways, September 1966.
11. "Ten Rural Highway Base Stabilization Projects," J. H. Havens and W. B. Drake; Research Report 123, Kentucky Department of Highways, February 1952.
12. "Report No. 1 on a Bank Gravel Base Containing Calcium Chloride," W. B. Drake; Research Report 75, Kentucky Department of Highways, February 1952.
13. "Report No. 2 on a Bank Gravel Base Containing Calcium," W. B. Drake; Kentucky Department of Highways, 1952.
14. "Memorandum Report on Portland Cement Stabilization of Western Kentucky Gravels," R. C. Deen; Research Report 171, Kentucky Department of Highways, November 1961.
15. Preliminary Proposal, F 1-1(6), Fulton Co, Transportation Cabinet, Department of Highways, Frankfort, Ky, September 21, 1984.

APPENDIX I

American Engineering Company's Reports to the Turnpike Authority of Kentucky, Kentucky Transportation Cabinet, and Liberty National Bank and Trust Company (December 14, 1981; March 18, 1983; and April 6, 1984)

American Engineering Co.
Consulting Engineers

800 Corporate Drive
Lexington, Kentucky 40503

606-223-4400

December 14, 1981

Liberty National Bank and Trust Co.
P. O. Box 32500
Louisville, Kentucky 40232

The Turnpike Authority of Kentucky
State Office Building
Frankfort, Kentucky 40622

Kentucky Department of Transportation
State Office Building
Frankfort, Kentucky 40622

RE: The Jackson Purchase Parkway Inspection Report

Gentlemen:

This report on the condition of the Jackson Purchase Parkway is submitted, as required by contract dated April 1, 1981 for your use and files.

The parkway, considering its age, is in a good state of repair. The pavement base and subgrade appear to be structurally sound. The roadside appurtenances are being closely monitored and well maintained, and a review of the Department of Transportation's Bridge Inspection Reports dated September, 1979 to October, 1980 reveals an adequate inspection program which noted no major deficiencies. The parkway, generally, is delivering a safe, comfortable ride. One area, however, should be considered next year for improvement. The "crushed river gravel" bituminous surface south of Mayfield - M.P. 21+ to 0+ - is deteriorating. Traverse and longitudinal cracking, accompanied by rutting in the outside lanes, is evident in varying degrees in both the north and south bound lanes. The north bound lanes, particularly a seven plus or minus mile section immediately south of the Hickman-Graves Co. line, are in the worst condition and should be scheduled initially.

In upgrading the cracked and rutted pavement we would suggest specifically treating the cracks with a sand or plant mix seal before leveling and resurfacing. Reflective cracking would likely appear through any thin overlay in which the cracked surface being overlaid had not been repaired or removed.

An area of responsibility inherent in this report is the inspection of the parkway's drainage facilities. The Consultant was specifically charged in this regard with only the review and evaluation of the

American Engineering Co.
Consulting Engineers

800 Corporate Drive
Lexington, Kentucky 40503

606-223-4400

• March 18, 1983

Liberty National Bank and Trust Company
P. O. Box 32500
Louisville, Kentucky 40232

The Turnpike Authority of Kentucky
State Office Building
Frankfort, Kentucky 40622

Kentucky Transportation Cabinet
State Office Building
Frankfort, Kentucky 40622

RE: The Jackson Purchase Parkway Inspection Report

Gentlemen:

We have examined the Jackson Purchase Parkway and offer the following for your use and files.

The Parkway is being well maintained and is in good condition. The field inspections were completed March 2, 1983; items of significance are listed below.

- 1) The crushed river gravel bituminous surface, mile 25.5 +/- to 0 +/-, is deteriorating and is in need of improvement. Traverse and longitudinal cracking, accompanied by rutting in the outside lanes, is evident in varying degrees both north and south bound. The most aggravated section extends from the Hickman - Graves County line to the beginning of the facility, mile 8.5 +/- to 0 +/-, and is in need of immediate attention.
- 2) The headwall at the outlet of the 72 inch corrugated metal pipe at mile 19.07 has been severely damaged. The headwall and wingwalls have been completely severed from the pipe end and need to be repaired this season. Equally disturbing is the condition of the outlet ditch and the pipe itself. The outlet ditch immediately downstream of the pipe is showing significant scour and erosion and the pipe barrel appears twisted and deflected. Both these conditions need to be thoroughly investigated during the headwall/wingwall repair process.

American Engineering Co.
Consulting Engineers

800 Corporate Drive
Lexington, Kentucky 40503

606-223-4400

April 6, 1994

Liberty National Bank and Trust Company
P. O. Box 32500
Louisville, Kentucky 40232

The Turnpike Authority of Kentucky
State Office Building
Frankfort, Kentucky 40622

Kentucky Transportation Cabinet
State Office Building
Frankfort, Kentucky 40622

RE: The Jackson Purchase Parkway Inspection Report

Gentlemen:

This report on the condition of the Jackson Purchase Parkway is submitted, as required, by contract dated June 30, 1983, for your use and files.

The Parkway, considering its age, is delivering safe, comfortable and economical access to and from the Purchase area of the Commonwealth. The Parkway is being well maintained and is generally in good condition.

The field inspections were completed November 1, 1983. Items of special consideration are noted as follows:

- 1) The bituminous pavement between mile post 0 and mile post 8.4+, at the Hickman-Graves County line, is deteriorating rapidly and is in need of immediate attention. Load and shrinkage cracking, raveling and rutting is evident both north and southbound. The outside lanes between mile post 2.3+ and 3.4+ have been milled and a bituminous overlay placed. A bituminous overlay for this entire section of the facility should be a priority for this year. A structural evaluation of this section of the Parkway pavement should be considered. The Parkway pavement between mile post 8.4+ and mile post 21.5+ appears to be deteriorating much faster than the rest of the facility. This section of the Parkway should be considered for a bituminous overlay in the near future.
- 2) Most of the bituminous coated metal pipes inspected by the Consultant were losing the bituminous coating in the flowline. Three (3) drainage structures inspected were located in an

APPENDIX II

July 24, 1984, Memo Report: Observation

UNIVERSITY OF KENTUCKY

LEXINGTON, KENTUCKY 40506 - 0043

July 24, 1984

COLLEGE OF ENGINEERING
KENTUCKY TRANSPORTATION RESEARCH PROGRAM
TRANSPORTATION RESEARCH BUILDING

DRAFT

257-4513

TELEPHONE: (606) ~~XXXXXX~~
H.2.56

Mr. C. S. Layson, P. E.
Assistant State Highway Engineer
Administration and Research
Kentucky Department of Highways
Frankfort, Kentucky 40622

Subject: Jackson Purchase Parkway;
Pavement Condition Evaluation

Dear Mr. Layson:

Our inspection was made on July 10, 1984. Interval cracking (due to temperature and/or shrinkage) was anticipated; and several one-mile samplings were counted as we traveled from the US 62 junction southward. This type of cracking varied from site to site but persisted throughout. Only south of Bayou du Chien (Hickman-Graves County Line) was the severe map cracking in the wheelpaths so obvious. The cracking there is distinctively load-associated and appears to be due to weakness in the cement treated base. Weakening may have occurred too in the bituminous surface and base courses. Fatigue is the probable, failure mechanism. Only a small chunk of the cement-treated gravel base was recovered from the coring done July 20. It was excessively sandy.

It is significant to note that Hickory gravel was used north of Bayou du Chien and McDade's gravel was used southward. Obviously materials and other things changed.

Road Rater tests two years ago indicated that an overlay of about 3 inches would suffice for an 8-year period.

American Engineering's annual inspection report of 1981 called attention to the onset of wheelpath cracking.

Road Rater tests were made, July 20, at each of the sites where the cores were drilled. Those results will be made a part hereof (by insertion).

Four distinctive patterns of cracking were apparent. They are defined later herein. Each defines a different mechanism of deterioration.

In order to learn much more about the interior of the pavement at depth, it would be necessary to trench across the outer lane and to examine the cross section visually.

AN EQUAL OPPORTUNITY UNIVERSITY

Mr. C. S. Layson
July 24, 1984
Page 2

Some photos taken July 10 are included herein.

Various historical documents and pertinent information are appended hereto to provide a cursory file on the project. They are not indexed.

CRACKING

Four patterns of cracking are evident.

1. Longitudinal: Inside edge of inner wheelpath -- load associated, shear -- prominent from US 62 to I 24, reappears at various locations southward, associated with rutting.
2. Transverse: Very prominent throughout -- nearly straight line cracking across pavement (perpendicular to centerline), oftentimes in line with cracks extending through outside and inside shoulders, frequently grass is growing in both shoulder cracks. Sometimes cracks in shoulders do not coincide with cracks in mainline pavements. These are typical temperature cracks and shrinkage cracks. They are not altogether reflection cracks
3. Random, Irregular Cracking: Thought to have been initiated at the time of rolling and compacting surface course. Weathering and erosion have made them obvious. These cracks were observed within two years after construction. They are not load-related. This is the typical pattern observed on I 64 in Clark-Montgomery Counties and which led to overlayment because of eligibility under pre-1964 construction program. This pattern has been observed elsewhere also.
4. Wheelpath Cracking: Believed to be a punching-shear (sometimes called "punch out") attributable to weakness and (or) overload of the pavement. May be related to fatigue and (or) weathering of layers.

SURVEY NOTES

US 62 to I 24 (MP 54 to MP): the interval between cracks was 30 feet.

MP 51 to MP 50: 43 cracks were found.

MP 50.95: painted cracks, grass growing on inner shoulder; 1/4 inch rutting or wear.

MP 47.5 - MP 46.5: full-width overlay.

MP 45 - MP 44: 13 cracks, no grass growing on shoulders, cracks not readily apparent on shoulders. There was a rather continuous, longitudinal crack at the inner edge of the inner wheelpath.

Mr. C. S. Layson
July 24, 1984
Page 3

MP 30 - MP 29: 24 transverse cracks, no grass growing on shoulders; longitudinal cracking almost continuous in inner wheelpath. Brownish overlay began at MP 29.95 and continued to near MP 29. Rutting was 1/4 inch.

KY 131, exit ramp, S.B.: 4 major transverse cracks; none apparent on entrance ramp.

MP 27, Mayfield Creeek and US 45: overlay looks redish black; no prominent cracks. Hickory chert gravel plus river gravel from Columbus; bleaching red; ends at MP 22.6.

MP 19 - MP 18: cracks in shoulder about 15 feet apart; many showing grass; inside shoulder shows some grass in cracks which do not enter main pavement. There are blowups in the outer shoulder pavement at MP 18.85, MP 18.65, MP 18.60; three or four cracks southward had heaved. There were 11 cracks (major) in the mainline pavement.

MP 14: full-width patch.

MP 13 - MP 12: 19 1/2 transverse cracks.

MP 8.25, Hickman County Line: began chert gravel on outer shoulder; inner shoulder changed to gray again.

MP 5.65: map cracking (severe) in wheelpaths of outer lane (near beginning of full-width overlay patch); rutting was 3/8 to 1/2 inch in the wheelpaths of the northbound outer lane and 3/4 to 1 inch in the inner wheelpath there. Although there was severe cracking in the wheelpaths on the southbound side, rutting was only about 3/8 inch. The overlay or patch was only about 1,000 feet long.

Chert surface weathered more (and ravelling) beginning at Hickman County Line. There was major cracking near the 2-mile, Fulton exit sign. Outer lane was overlaid to MP 2.35; both lanes were overlaid to 2 miles ahead of overpass at Exit 1. Reverted to gravel surface which was rough and more severely cracked; shoulders were gray. Major transverse cracks were 20 - 40 feet apart.

MP 0 to MP 1 (northward): cracking in wheelpaths.

Exit ramp at KY 307 showed random, irregular cracking (not related to wheelpath cracking). Patch (overlay) started at MP 2.35, ended 0.1 mile before Graves County Line (MP 8.6).

Mayfield ByPass (northbound): Has been overlayed. Cracking (inside lane only, first 0.8 mile); twice as many in inside lane as in outer. Fifty nine counted in 1/2 mile (under bridge; 15 to 25 feet apart for 0.35 mile; 60 cracks counted in 0.2 mile. This is 1962 construction (DGA Base).

Mr. C. S. Layson
July 24, 1984
Page 4

CORES

Cores were drilled July 20, 1984. A few cores were taken on the Mayfield By-Pass approximately a year previously but this location and conditions were not recorded for retrieval. Verbal reports implied that the cracks went full depth and were wider at the bottom than they were at the top. In speaking of cores taken of a crack zone, the nature or pattern of the crack was not described. It seems entirely possible that temperature (or shrinkage) cracks could exhibit that characteristic due to deterioration progressing at the bottom of the layer.

Temperature shrinkage cracks would normally reflect through thin overlayment in a short time of cooling weather (winter).

Photos of cores taken July 23 follow hereafter.

DESIGN VS. ACTUAL TRAFFIC LOADING

The pavement structure was designed for 40 - 80 million equivalent 5,000-lb. wheel loads (ref. E. B. Drake's memo of July 12). If we assume that the mid-range value was applicable and that 60 million divided by 32 converts to 2 million EAL's, we may consider the design EAL to have been approximately 2 million. A current estimate of accumulated EAL's provided by Planning (Drake's memo of July 19) is 1.48 million. This does not imply that the design was inadequate; it may mean that some of the pavement layers were (are) inherently weaker than they were expected to be. This notion seems to be supported by the performance of pavements north of Bayou du Chien.

STRIPPING

It should not be presumed that stripping caused failure; some stripping may accompany failure. It is not clear whether the stripping observed resulted from load stressing or affinity of chert surfaces for water. It seems that affinity would have created far more bare aggregate than was observed in the cores (very disaggregated, rubbly pieces).

Some stripping at the surface apparent where chert gravel was exposed. This was most prominent southward from Bayou du Chien. The surface there 100 percent chert and was from a different source than was used from there northward. North-bound, the principal source was in the vicinity of Hickory.

Anti-stripping agents were recommended (at least by Materials people). Use of them has not been confirmed (currently).

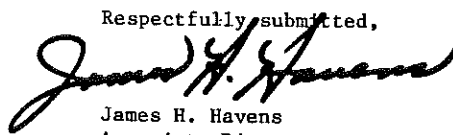
STABILITY AND STRENGTH

Stabilities of gravel, bituminous concretes were fairly good (Epley's letter, July 9). Elsewhere on the Parkway, asphalt paving appears to be performing adequately.

Mr. C. S. Layson
July 24, 1984
Page 5

High strength was not sought in the cement-treated gravel base. It was intended to achieve perhaps 300 psi compressive strength but not more. This was intended to minimize shrinkage cracking (regular interval, transverse) and reflection through the asphaltic concrete (ref. R.R., Kentucky Department of Highways, March 1966; "A General Survey of Highway Construction Materials (Jackson Purchase Region)." R. C. Deen and J. H. Havens)). Except for the section south of Bayou du Chien, those needs appear to have been met.

Respectfully submitted,

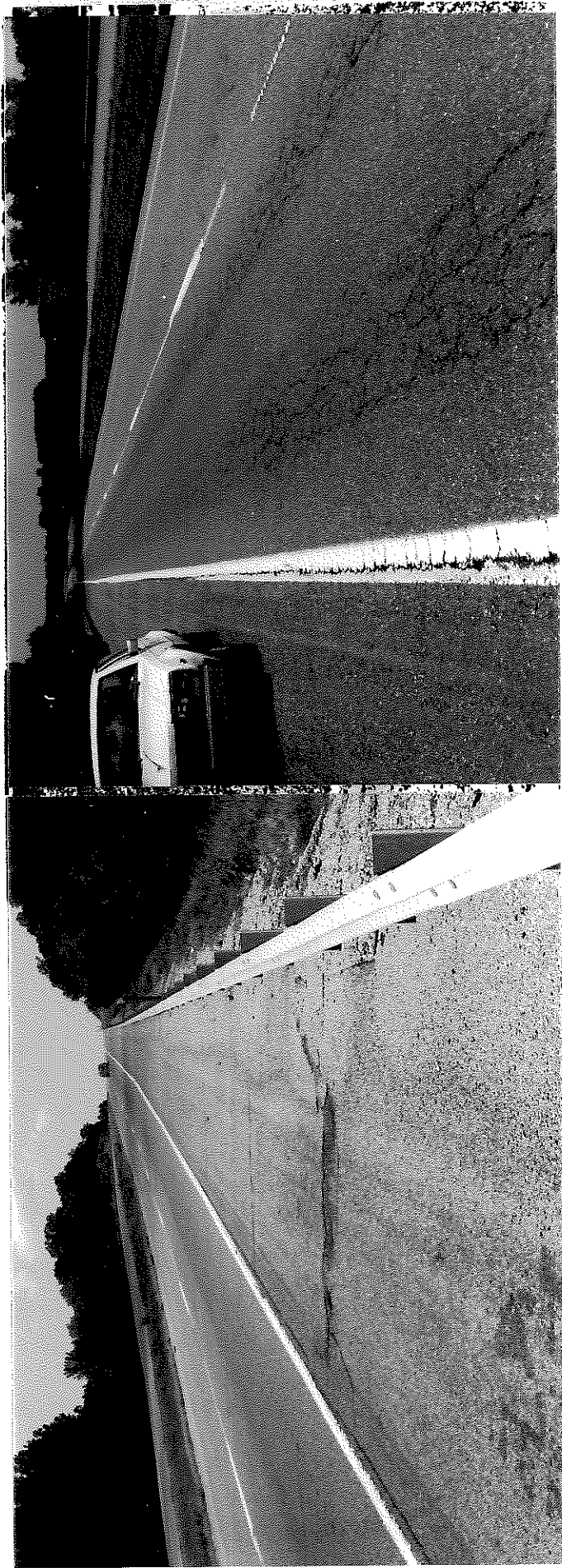


James H. Havens
Associate Director

JHH:jfh
cc: B. L. Wheat



Photographs Taken July 10, 1984



Photographs Taken July 10, 1984



Photographs Taken July 10, 1984



Cores Taken July 20, 1984



Coring Site; MP 2.9, Southbound
July 20, 1984



Coring Site; MP 5.8, Southbound
July 20, 1984



Coring Site; MP 7.6, Northbound
July 20, 1984

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COLLEGE OF ENGINEERING
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TRANSPORTATION RESEARCH BUILDING

257-2524

TELEPHONE: (606) ~~257-2524~~

H.5.23

MEMORANDUM

TO: James H. Havens, P. E.
Associate Director
Kentucky Transportation Research Program

FROM: Gary W. Sharpe, P. E. *gws*
Research Engineer
Kentucky Transportation Research Program

DATE: July 27, 1984

SUBJECT: Deflection Analyses for Jackson Purchase Parkway
MP 0.0 to MP 8.34

Three series of deflection analyses have been completed for the Jackson Purchase Parkway MP 0.00 to MP 8.34. The first analysis was completed in the summer of 1982 and involved only the outside lanes for MP 0.00 to MP 3.41. A second series of deflection analyses was completed in November 1983 and involved sections from MP 3.41 to MP 8.34. A third series of deflection measurements was obtained July 11-12, 1984 and involved sections from MP 0.00 to MP 8.34. A summary of results for deflection analyses and associated overlay thickness recommendations corresponding to expected 8-year accumulations of EAL is presented in the attached table.

Procedures for evaluation and overlay design have been detailed in a number of research publications and will not be discussed in detail herein. However, it should be noted that effective pavement behavior has been expressed as a combination of effective thickness of reference quality asphaltic concrete (480 psi) and effective subgrade conditions. Effective subgrade moduli have been determined for seasonal variations and are presented in the attached table. Overlay thickness designs are determined as the difference between thickness requirements for the future fatigue (traffic) need and the effective pavement condition as determined by deflection analyses. Overlay recommendations were determined for each test site. Overlay thickness recommendations were then combined for all sites and 80th percentile statistically expected overlay thickness requirements were determined and are presented in the attached table. Additional information regarding specifics for evaluation procedures may be supplied if desired when additional time is available for presentation.

It may be seen from the attached table that deterioration has been accelerated during the past two years. Initial deflection analyses in the

James H. Havens
July 27, 1984
Page 2

summer of 1982 did not indicate severe deterioration and overlay recommendations were small. Additional evaluations in November 1983 indicate accelerated deterioration and greater overlay thickness recommendations. Analyses of July 1984 indicate even greater levels of deterioration and also indicate greater overlay thickness requirements.

Time constraints did not permit analyses of July 1984 data by separate sections to correlate with earlier test sections. Some maintenance action in the form of milling and replacement of asphaltic concrete surfacing has been observed. A cursory inspection of data indicates that these activities may have some beneficial effect but this has not been quantified. The inclusion of these data for the total section may also mask a portion of the apparent severity for the July 1984 analyses. Additional and more detailed analyses may be completed if desired.

Per your request, additional information relating to the results of deflection testing for sections of the US 45 By-Pass at Mayfield are also included. These analyses were completed during the summer of 1982. Unfortunately, the results of these analyses were not available when needed to be considered in the development of a rehabilitation strategy for this section and the development of a contract proposal.

GWS:jfh
Attachments
cc: Robert C. Deen
Rolands L. Rizenbergs

SUMMARY OF DEFLECTION ANALYSES AND OVERLAY THICKNESS
DESIGN RECOMMENDATIONS -- PURCHASE PARKWAY
MP 0.00 TO MP 8.35 AND
US 45 BY-PASS MP 21.60 TO MP 25.00

MILEPOINTS		DIRECTION	LANE	DATE OF TEST	CBR %	EFFECTIVE BEHAVIOR		EIGHT YEAR EAL'S	RECOMMENDED OVERLAY THICKNESS (inches)
BEGIN	END					THICKNESS OF REFERENCE AC (inches)	ESTIMATED DETERIORATION %		
PURCHASE PARKWAY									
0.00	3.41	North	Outside	7-82	4.95	5.6	14	1.05X10 ⁶	.73
0.00	3.41	South	Outside	7-82	4.58	5.1	21	1.05X10 ⁶	1.35
3.41	5.90	North	Outside	11-83	5.4	4.6	28	1.09X10 ⁶	2.21
3.41	5.90	South	Outside	11-83	6.1	4.7	26	1.09X10 ⁶	1.95
5.90	8.35	North	Outside	11-83	5.0	4.6	30	1.09X10 ⁶	3.25
5.90	8.35	South	Outside	11-83	4.6	3.9	41	1.09X10 ⁶	3.90
0.00	8.35	North	Outside	7-84	7.4	3.7	43	1.10X10 ⁶	2.50
0.00	8.35	North	Inside	7-84	6.7	4.5	30	1.10X10 ⁶	2.25
0.00	8.35	South	Outside	7-84	5.6	3.8	41	1.10X10 ⁶	3.45
0.00	8.35	South	Inside	7-84	5.1	4.3	34	1.10X10 ⁶	3.00
US 45 BY-PASS									
21.60	22.50	North	Outside	7-82	3.9	4.8	17	1.7X10 ⁶	4.39
22.50	25.00	North	Outside	7-82	10.0	4.2	27	1.7X10 ⁶	2.90
21.60	23.30	South	Outside	7-82	5.0	5.1	13	1.7X10 ⁶	4.14
23.30	25.00	South	Outside	7-82	7.3	4.5	22	1.7X10 ⁶	3.39

Mr. Rolands L. Rizenbergs, P. E.
Associate Assistant State Highway
Engineer -- Pavement Management
Kentucky Department of Highways
Frankfort, Kentucky 40622

Dear Mr. Rizenbergs:

Enclosed are results of recent structural evaluations of pavement sections on the Kentucky Parkway system. The results of these evaluations were transmitted by telephone by Gary Sharpe March 9, 1984. Mr. Sharpe's memorandum is attached and herein provides for official transmittal of the results of these evaluations. Please note the memorandum by Mr. Sharpe presents a summary of overlay recommendations corresponding to 8-year estimates for accumulation of EAL's. Mr. Sharpe's memorandum also presents overlay thickness design curves for each pavement section which may be used for rational modification of the recommended overlay thicknesses with regard to variations of accumulations of EAL's and the associated pavement life.

Additional results for other pavement sections will be transmitted as evaluations are completed. Please contact this office at your convenience with regard to questions or comments concerning these analyses or the need for additional evaluations.

Sincerely,



Robert C. Deen
Director

RCD:GWS:jfh
Attachments
cc: C. S. Layson

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TRANSPORTATION RESEARCH CENTER

257-4524
TELEPHONE ROOM 2000/2000X
H.S.23

MEMORANDUM

TO: Robert C. Deen
Director

FROM: Gary Wayne Sharpe, P. E.
Research Engineer

DATE: March 13, 1984

SUBJECT: Structural Evaluations of Pavements

Cumberland Parkway, Adair County MP 43.02 to MP 53.09
Cumberland Parkway, Pulaski County MP 76.55 to MP 84.31
Green River Parkway, Butler County MP 25.00 to MP 32.64
Jackson Purchase Parkway, Hickman County MP 3.41 to MP 8.35
Jackson Purchase Parkway, Graves County MP 8.35 to MP 13.65
Mountain Parkway, Magoffin County MP 67.40 to MP 71.65
Mountain Parkway, Magoffin County MP 71.65 to MP 75.63
Western Kentucky Parkway, Caldwell County MP 9.91 to MP 14.87

Structural evaluation and overlay design procedures have been completed for the pavement sections presented above. Overlay thickness recommendations corresponding to 8-year estimates for EWL's (converted to EAL's by dividing by 32) were determined and submitted by telephone to Rolands L. Rizenbergs March 9, 1984. The following information is herein transmitted as official documentation of structural evaluations for these pavement sections.

A summary of 80th percentile overlay thickness recommendations and other site specific information regarding these pavement sections is presented in the attached table. A refinement of structural evaluation procedures has now made it possible to determine overlay thickness recommendations for a range of EAL's which may then be used to develop an overlay thickness versus EAL design curve specific for the sub-grade and pavement conditions as determined by deflection measurements and structural evaluations. Such curves are attached for each pavement section of the attached table. The information presented may be used to modify the recommended "8-year" overlay thicknesses for various increases or reductions of desired fatigue life dependent upon specific conditions for each pavement section.

GWS:jfh

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SUMMARY OF OVERLAY THICKNESS RECOMMENDATIONS

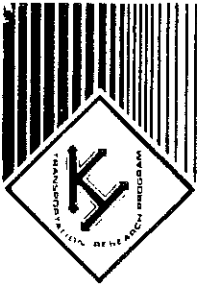
ROUTE	COUNTY	DIRECTION	SECTION MILEPOINTS		EXISTING LAYER		EIGHT YEAR EAL ESTIMATES	DATE OF DEFLECTION TESTING	OVERLAY THICKNESS RECOMMENDATIONS	DEFLECTION TESTING MILEPOINTS	
			BEGIN	END	THICKNESSES					CORRESPONDING TO EIGHT YEAR EAL ESTIMATES (Inches)	
					ASPHALTIC CONCRETE (Inches)	CRUSHED STONE (Inches)	BEGIN				END
Cumberland Parkway	Adair	East	43.02	53.09	13.50	0.00	0.42	10-27-83	0.00	43.00	53.00
Cumberland Parkway	Adair	West	43.02	53.09	13.50	0.00	0.42	10-27-83	0.00	43.00	53.00
Cumberland Parkway	Pulaski	East	76.55	81.80	10.50	6.00	0.50	10-27-83	0.00	76.60	81.80
Cumberland Parkway	Pulaski	East	81.80	84.31	10.50	6.00	0.50	10-27-83	0.70	81.20	84.20
Green River Parkway	Butler	North	25.00	32.64	9.50	6.00	1.10	11-16-83	1.75	25.00	32.60
Green River Parkway	Butler	South	25.00	32.64	9.50	6.00	1.10	11-16-83	2.54	25.00	32.60
Jackson Purchase Parkway	Hickman	North	3.41	5.90	6.50	13.00	1.10	11-16-83	2.21	3.40	5.00
Jackson Purchase Parkway	Hickman	North	5.90	8.35	6.50	13.00	1.10	11-16-83	3.25	5.00	8.20
Jackson Purchase Parkway	Hickman	South	3.41	5.00	6.50	13.00	1.10	11-16-83	1.95	3.40	5.00
Jackson Purchase Parkway	Hickman	South	5.00	8.35	6.50	13.00	1.10	11-16-83	3.90	5.00	8.20
Jackson Purchase Parkway	Graves	North	8.35	13.65	6.50	13.00	1.10	11-16-83	1.89	8.30	13.60
Jackson Purchase Parkway	Graves	South	8.35	13.65	6.50	13.00	1.10	11-16-83	2.21	8.30	13.60

SUMMARY OF OVERLAY THICKNESS RECOMMENDATIONS

ROUTE	COUNTY	DIRECTION	SECTION MILEPOINTS		EXISTING LAYER THICKNESSES		EIGHT YEAR EAL ESTIMATES	DATE OF DEFLECTION TESTING	OVERLAY THICKNESS RECOMMENDATIONS CORRESPONDING TO EIGHT YEAR EAL ESTIMATES (Inches)	DEFLECTION TESTING MILEPOINTS	
			BEGIN	END	ASPHALTIC CONCRETE (Inches)	CRUSHED STONE				BEGIN	END
Mountain Parkway	Mazoffin	East	67.40	71.65	8.00	12.00	0.71	10-20-83	0.85	67.00	71.60
Mountain Parkway	Mazoffin	West	67.40	71.65	8.00	12.00	0.71	10-20-83	0.32	67.00	71.60
Mountain Parkway	Mazoffin	East	71.65	75.60	8.00	12.00	2.50	10-20-83	1.97	71.80	75.60
Mountain Parkway	Mazoffin	West	71.65	75.60	8.00	12.00	2.50	10-20-83	1.81	71.80	75.60
Western Kentucky Parkway	Caldwell	East	9.91	11.70	8.20	13.00	1.20	11-15-83	1.65	10.10	11.70
Western Kentucky Parkway	Caldwell	West	9.91	11.70	8.20	13.00	1.20	11-15-83	2.01	10.10	11.70
Western Kentucky Parkway	Caldwell	East	11.70	14.87	8.20	13.00	1.30	11-15-83	1.36	11.70	15.00
Western Kentucky Parkway	Caldwell	West	11.70	14.87	8.20	13.00	1.30	11-15-83	1.87	11.70	15.00

APPENDIX III

August 13, 1984, Memo Report: Trenching



KENTUCKY TRANSPORTATION RESEARCH PROGRAM

UNIVERSITY OF KENTUCKY

August 13, 1984

College of Engineering
Transportation Research Building
533 South Limestone
Lexington, Kentucky 40506 0043
Telephone: 606-257-4513
H. S. 23

Mr. C. S. Layson, P. E.
Assistant State Highway Engineer
Administration and Research
Kentucky Department of Highways
Frankfort, Kentucky 40622

Subject: Jackson Purchase Parkway;
Pavement Condition Evaluation

References: 1) Our Draft Report, July 24, 1984
2) Your letter, August 2, 1984,
authorizing trench sections to
be excavated and studied.

Dear Mr. Layson:

As planned, trenching was accomplished at four sites on August 8. The exposures were very revealing, and the discoveries surely will be reassuring and rewarding for the effort. The cracking in the wheelpaths which had appeared to be symptomatic of deep structural failure, proved to be shallow (limited to about 3 inches of depth). The asphaltic concrete was otherwise unaffected and the cement-treated gravel base was found to be sound and strong -- and dry. The distress may therefore, be attributed to weakness (low stability) of the asphaltic concrete surface and base. That is a capsule summary of findings. Here follows a capsule summary of recommendations toward restoring and renewing the pavement for a stated term of service.

RECOMMENDATIONS

1. Mill nominally 2 inches off the outer lane; repave; overlay both lanes with not less than 1 inch of surface.
2. In-fill cracks with dry sand and prime before overlaying; in-filling may be done with asphalt-coated sand (sand-asphalt); overlay full width.
3. So-called stress-relief interlayer should be avoided.

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Mr. C. S. Layson
August 13, 1984
Page 2

4. Overlayment mixture should contain anti-strip admixture if composed entirely of gravel; a mixture composed of a 50-50 blend of limestone and gravel should be employed experimentally on a significant portion of the project.

STRIPPING

Stripping, per se, was not observed at any of the sites. During excavation, pieces of the asphaltic concrete were broken apart. The asphalt appeared black and shiny. Gravel surfaces frequently appeared uncoated but were black and oily. Thus, the bond of the asphalt to the gravel seemed impaired (weakened).

Of course, the asphalt had bleached or otherwise been eroded from the aggregate surfaces at the top of the pavement.

Asphalt was extracted from cores, and viscosities were measured. Gradations of aggregate are given. Asphalt contents and other data are appended.

CEMENT CONTENT

Both Wm. B. Drake and I recall that the cement dosage of the gravel base south of Bayou du Chien was reduced -- perhaps 0.5 percent below the rate used on the northern sections. The strength of the cement-treated base did not appear to have been seriously reduced. Cores could not be recovered easily because of the tendency for large, hard chert particles to snag onto the core bit and to disrupt the cutting zone.

A core extracted at M.P. 5.8 was tested in compression and had an apparent strength of 808 psi.

OTHER OBSERVATIONS

The thickness of asphaltic concrete at M.P. 1.75 was found to be nominally 1 inch thinner than was found by coring and trenching between M.P. 8 and M.P. 9.

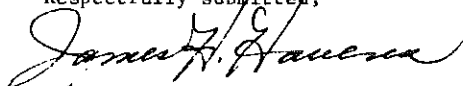
There was no indication of rutting (subsidence) at the bottom of the asphaltic concrete. Rutting in the asphaltic concrete is shown by measured thicknesses of asphaltic concrete (from the base line).

Gary Sharpe's analysis of Road Rater data, in terms of recommended thicknesses of overlays needed for restructuring the pavement, are attached hereto.

Mr. C. S. Layson
August 13, 1984
Page 3

Photos are appended.

Respectfully submitted,

A handwritten signature in cursive script, reading "James H. Havens".

James H. Havens
Associate Director

JHH:jfh
Attachments

cc: Gary Sharpe
David Allen
R. C. Deen
E. B. Drake
Harrison Evans
B. L. Wheat

ANALYSIS OF CORE

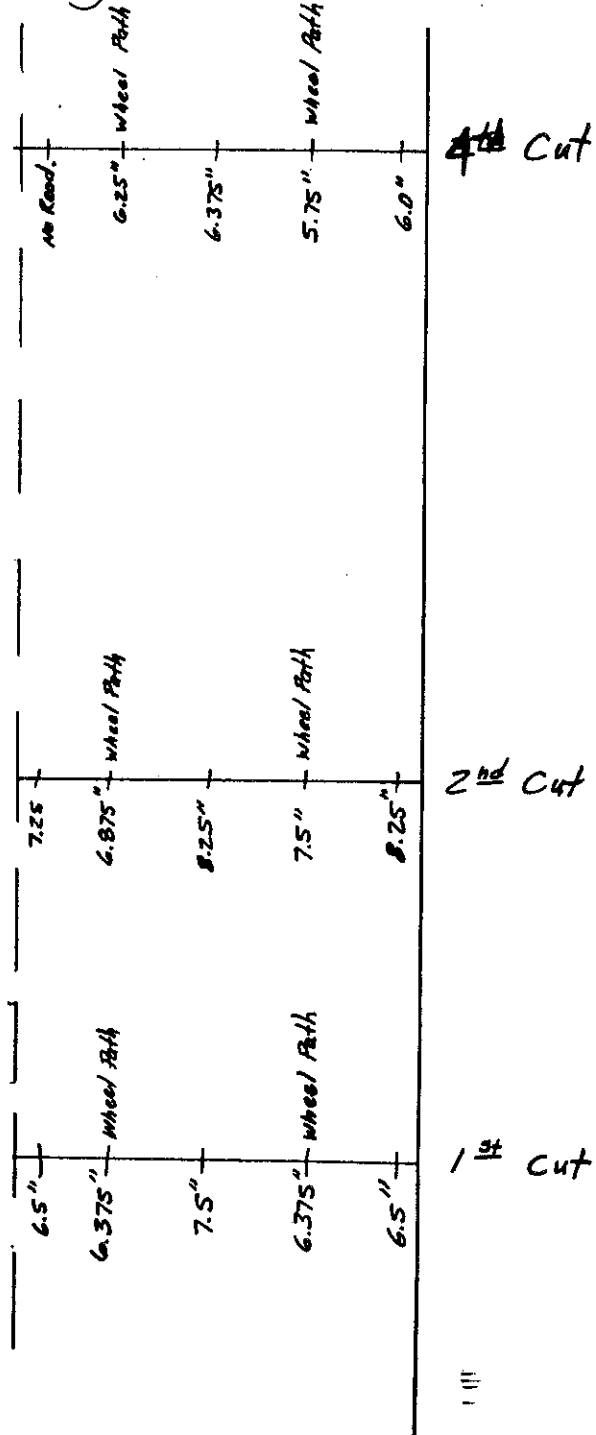
M.P. 518, 513 L, B

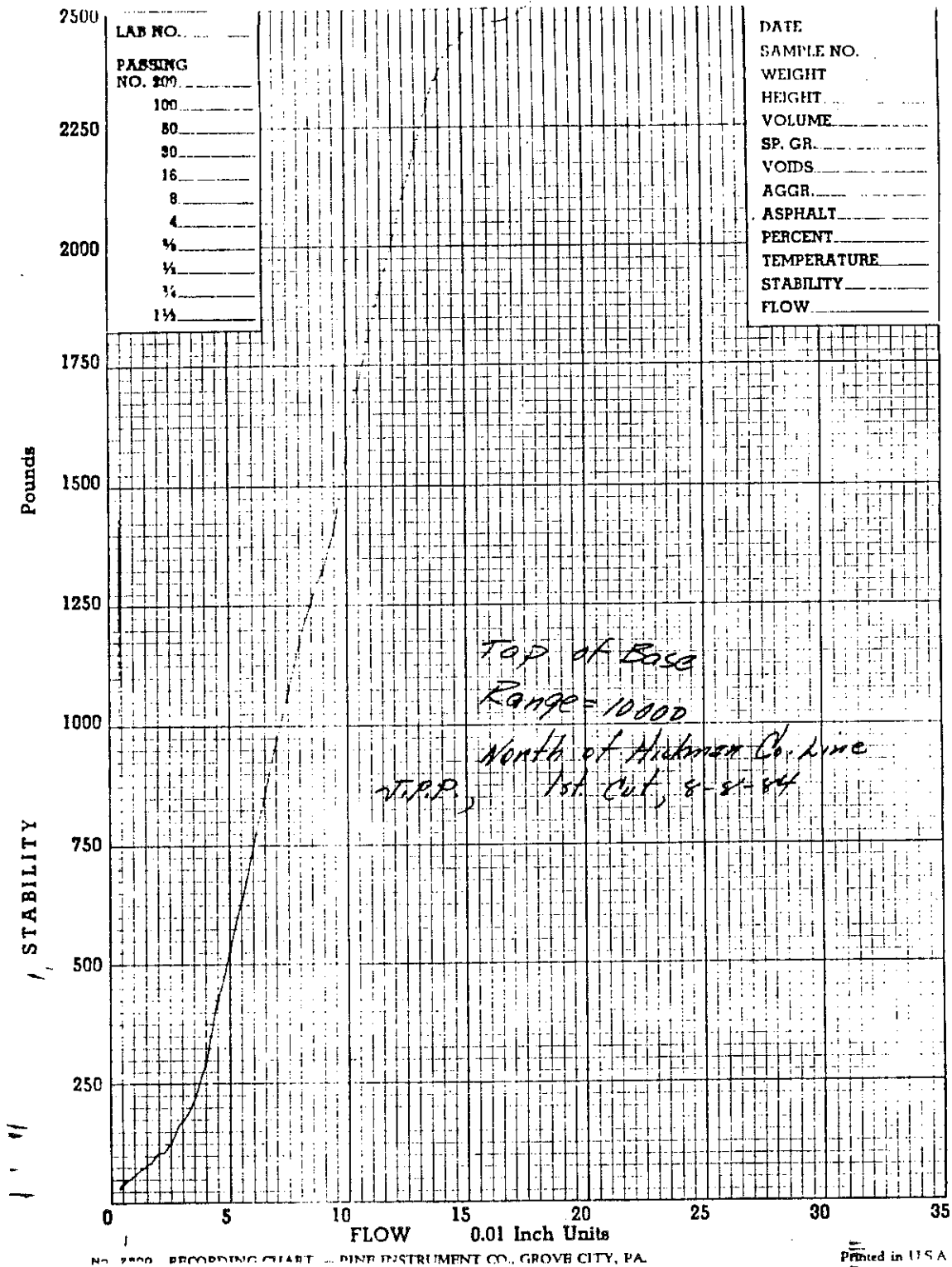
	<u>Surface</u>	<u>Base</u>	
		<u>Top Half</u>	<u>Bottom Half</u>
Asphalt Content (%)	7.14	6.76	6.57
Viscosity (275°F) (Centistokes)	979	720	458
<u>Gradation</u> sieve	<u>Percent</u> <u>surface</u>	<u>Passing</u> <u>Top Half</u>	<u>Bottom Half</u>
3/4"		98.05	95.96
1/2"		87.40	72.61
3/8"	94.78	73.31	56.78
No. 4	74.69	52.73	44.34
No. 8	61.07	42.71	37.90
No. 16	50.70	36.03	33.52
No. 30	38.70	29.14	27.65
No. 50	20.12	27.63	12.31
No. 100	10.51	19.00	4.22
No. 200	7.78	16.74	2.60
Penetration (77°)	12	20	29

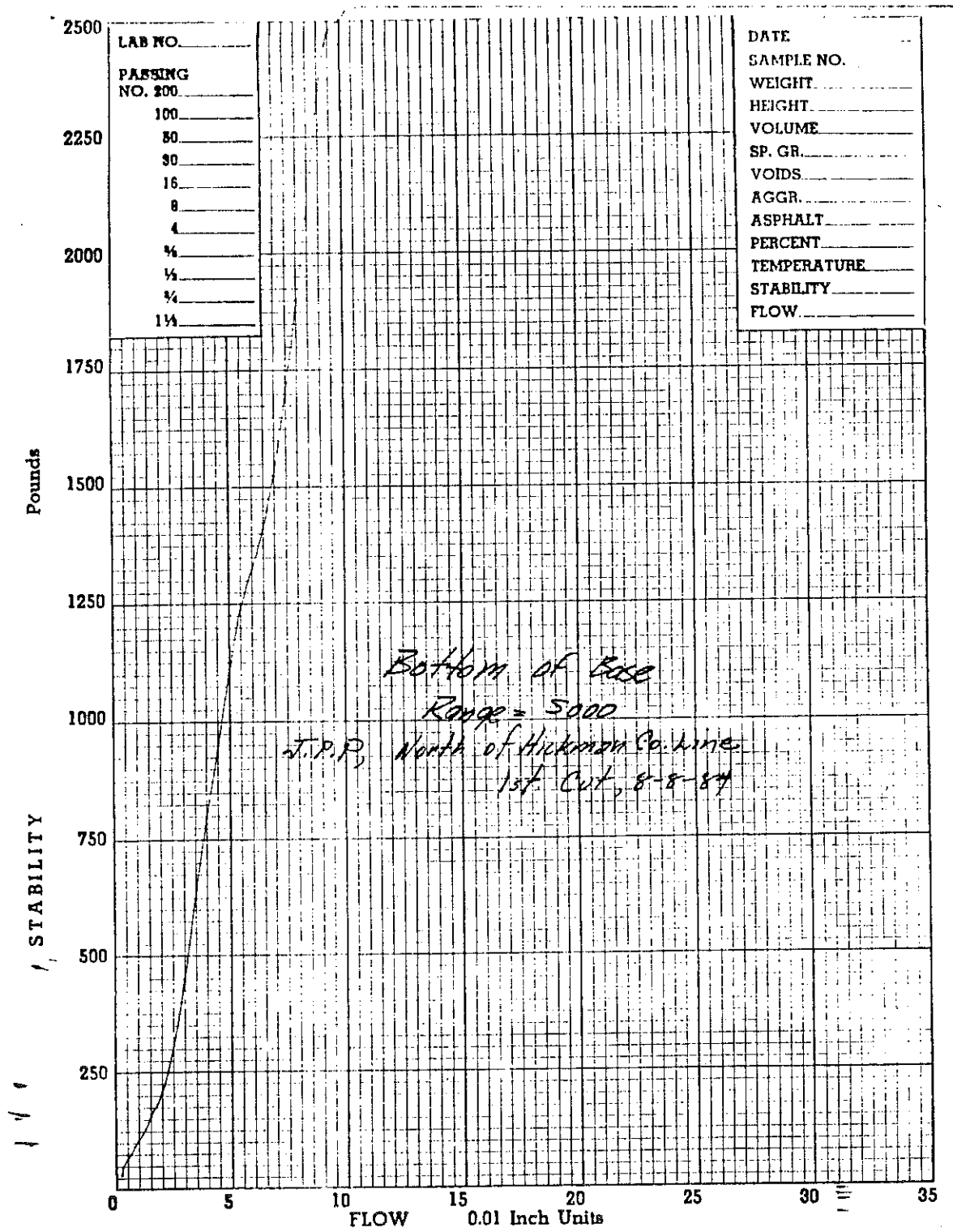
JACKSON PURCHASE PARKWAY (8-8-84)

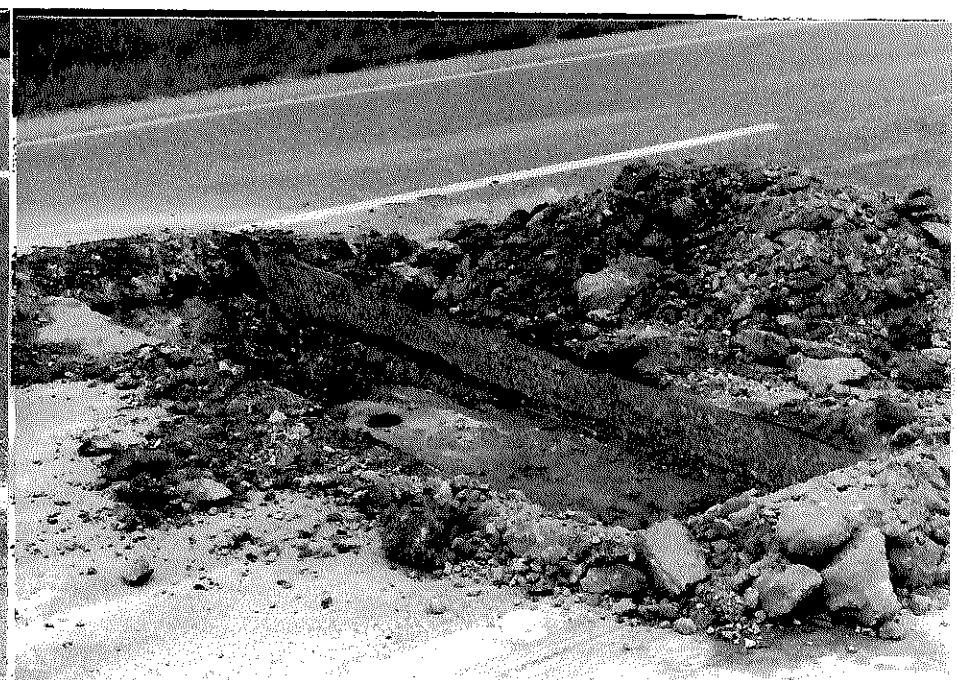
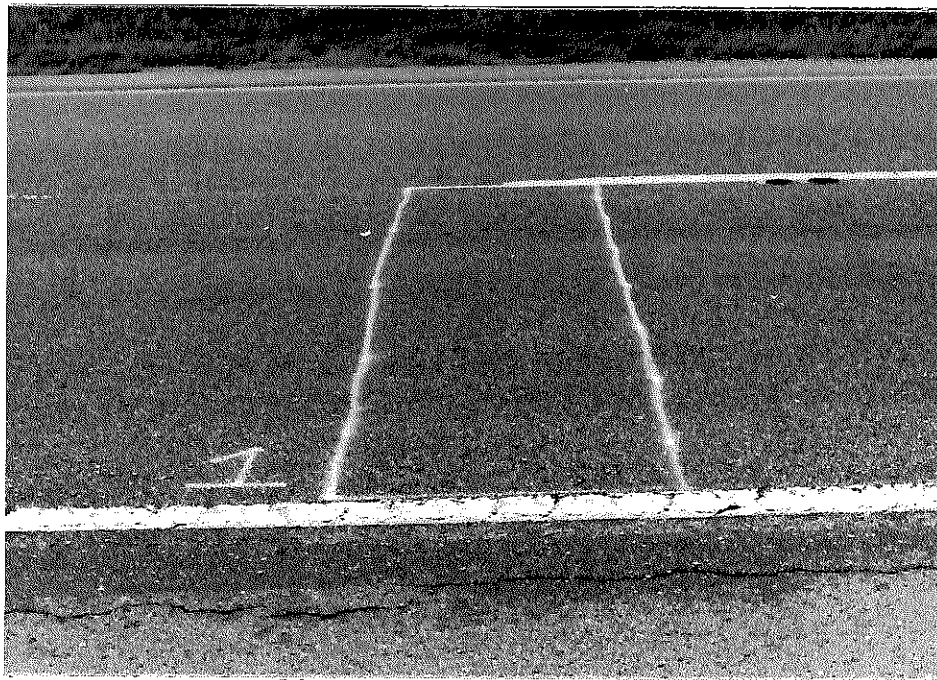
MEDIAN

S.B.L. →

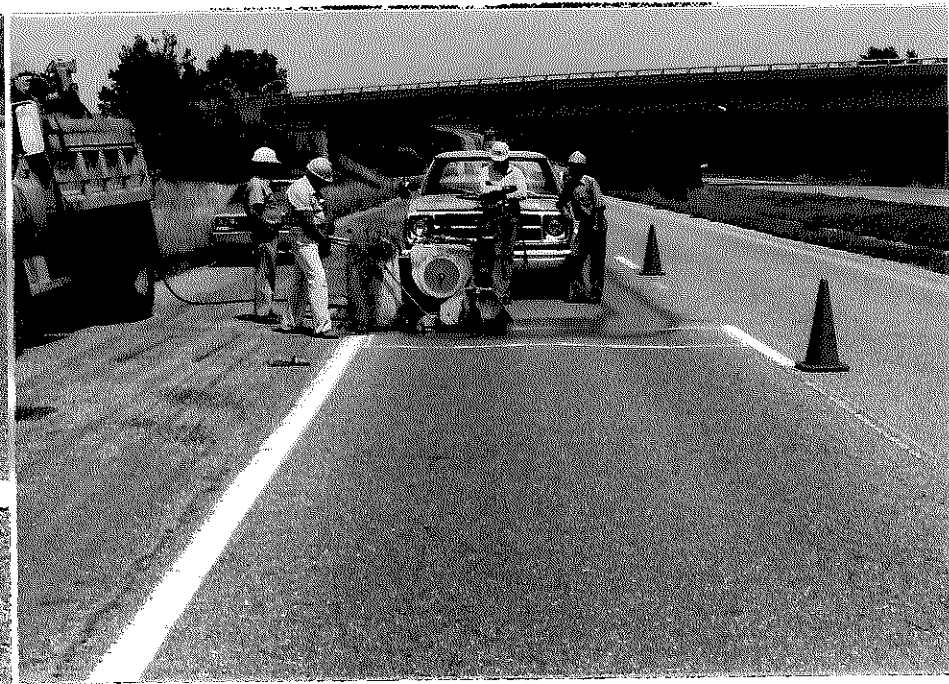
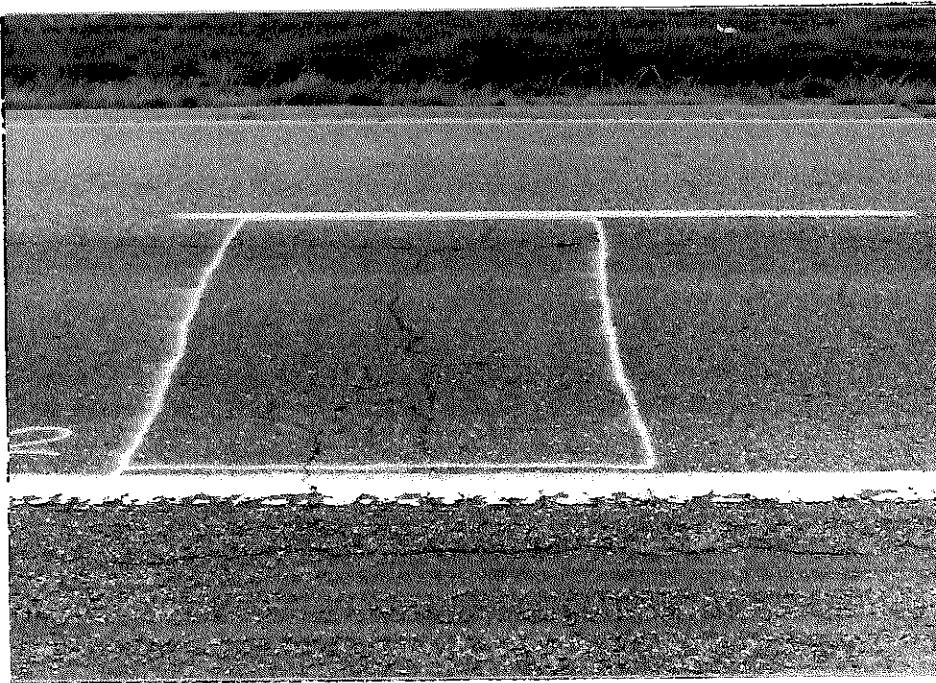








Site 1. Immediately North of Graves-Hickman County Line; Chosen as Control Site; Bituminous Concrete Composed of Crushed Limestone and Partially Crushed Gravel; August 8, 1984.



-48-

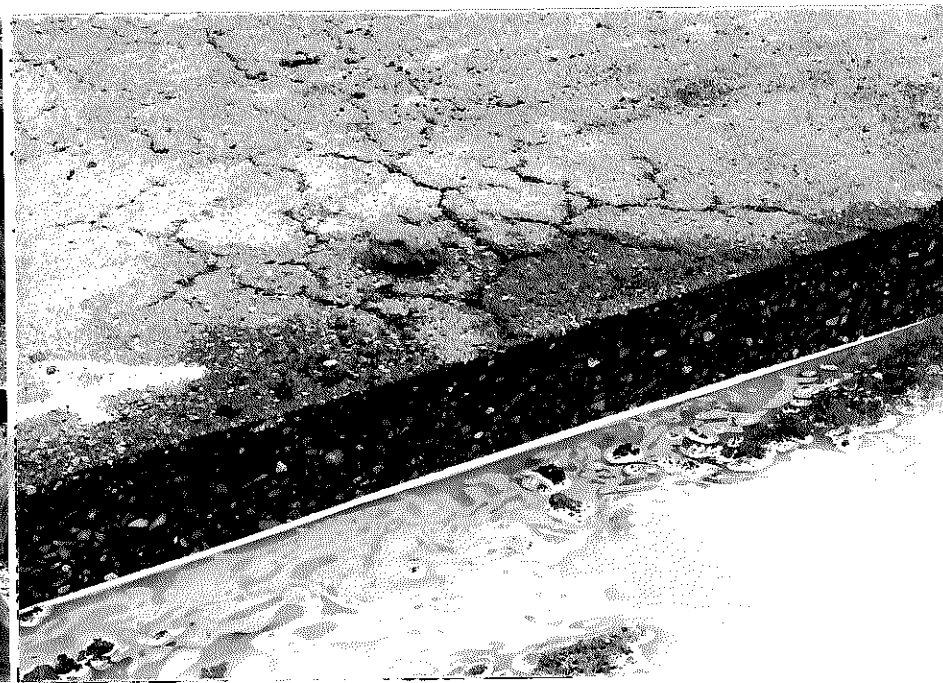
Site 2. Immediately South of Hickman County Line; Section Showed Transverse Shrinkage Crack; Gravel Aggregate; August 8, 1984.



Site 2 (continued)

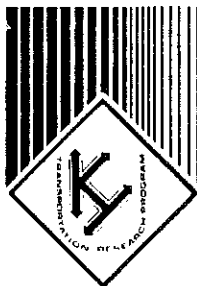


Site 3. 500 Feet Southward from Site 2; No Transverse Cracking; Cracking in Wheelpaths; August 8, 1984.



-51-

Site 4. JPP MP 1.75, Southbound Toll-Free Section; Cracking in Wheelpaths; August 8, 1984.



KENTUCKY TRANSPORTATION RESEARCH PROGRAM

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College of Engineering
Transportation Research Building
533 South Limestone
Lexington, Kentucky 40506-0043
Telephone: 606-257-4513

MEMORANDUM

Memorandum To: James H. Havens, P.E.
Associate Director
Kentucky Transportation Research Program

Memorandum From: Gary W. Sharpe, P. E. *GWS*
Research Engineer
Kentucky Transportation Research Program

Subject: Overlay Thickness Recommendations for Rehabilitation
Activities -- Jackson Purchase Parkway
Milepoint 0.00 to Milepoint 8.34

Date: August 9, 1984

Deflection data were obtained July 16, 1984 for section of the Jackson Purchase Parkway, Milepoint 0.00 to Milepoint 8.34. Initial analyses were completed on the basis of the total section length. Per your request, the data were re-evaluated on the basis of shorter sections corresponding to evaluations of data obtained earlier and reported by memorandum July 27, 1984.

Re-evaluation did result in the determination of a small error associated with factors used to adjust for seasonal variations in measured deflections. Thus, the following recommendations may differ to a small degree from earlier analyses and are presented in the attached table.

Overlay thicknesses are presented for three sections. Variations in recommended overlay requirements are generally related to variations in effective pavement condition and effective subgrade condition determined from analyses of deflection data. Overlay thickness recommendations are representative of requirements associated with the accumulation of 1.10×10^6 Equivalent Axleloads (EAL's) for the next eight (8) years (1984 to 1992) and were determined on the basis of pavement condition determined from analysis of deflection data.

On August 8, 1984, I inspected trenching activities for these same pavement sections. Inspection of the cut faces of the trenches provided no evidence of rutting or deterioration of the cement treated base. There was some evidence of rutting in the wheel paths which was primarily attributed to plastic flow in the asphaltic concrete and was generally restricted to the upper third of the asphaltic concrete layer. Depths of rutting were in the order of 0.50 to 0.75 inches.

Three basic cracking patterns were observed for these pavement sections: Transverse cracking were generally attributed to shrinkage of the asphaltic concrete and also reflective cracking through the asphaltic concrete because of shrinkage cracking of the cement treated base. Extensive alligator and map cracking were observed in the wheelpaths. It

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was speculated that these cracks were fatigue related but the depth and specific nature of these cracks could not be readily determined. Initial coring indicated extensive deterioration as "whole cores" could not be obtained. Thus, trenching was necessary to determine more specifically the nature of deterioration. Trenching indicated that map cracking extended to less than one-third the pavement depth. Viscosity test of core samples (performed by David Allen, P.E.) indicated very high viscosities for the asphaltic layer and therefore was indicative of brittle behavior. The potential for extensive fatigue and shrinkage cracking of the asphaltic concrete may be expected to increase with increased viscosity. Longitudinal cracking in each wheelpath was also observed. Trenching did indicate these cracks did extend throughout the pavement thickness.

Inspection of deflection data indicated a general shape of measured deflection bowls indicated a strong base and weak or deteriorated asphaltic concrete layer. Inspections after trenching further supported these determinations. The hard nature of the flint and chert material of the cement treated base prevented extensive coring of the cement treated base (after removal of the asphaltic concrete) as all available core barrels were virtually destroyed. Only one complete core could be recovered. Compressive strength testing of the one sample indicated compressive stress at failure of 818 psi and an associated static chord modulus of 218 ksi which further supports deflection measurements and visual observations.

These projects present opportunities for research relative to specific rehabilitation procedures: Three basic rehabilitation procedures have been considered for these pavement sections:

1. Overlay the existing pavement with asphaltic concrete.
2. Mill the existing pavement to some specified depth and then overlay with asphaltic concrete, and
3. Placement of a "crack relief" or "stress absorbing" layer followed by overlay with asphaltic concrete.

There has been considerable debate regarding the above procedures. Therefore, it is proposed to utilize each of the above procedures with one of the above sections.

Therefore, the following rehabilitation strategies are proposed:

- Section A: Milepoint 0.00 to Milepoint 3.41
- North -- Mill 2 inches and overlay with
2 inches asphaltic concrete
 - South -- Mill 2 inches and overlay with
3 inches asphaltic concrete
- Section B: Milepoint 3.41 to 5.90
- North -- Place a "stress absorbing" or
"crack relief" layer followed by
overlay with 2.5 inches asphaltic
concrete

South -- Place a "stress absorbing" or
"crack relief" layer followed by
overlay with 3.5 inches asphaltic
concrete

The "stress absorbing" layer may be in the form of a rubber asphalt-aggregate membrane which has been used in other areas where potential reflective cracking was considered a problem. Alternate stress absorbing layers such as sand and asphalt have also been discussed where sealing was more of a concern than reflective cracking.

Section C: Milepoint 5.90 to Milepoint 8.34

North -- Overlay with 3.5 inches asphaltic
concrete

South -- Overlay with 3.0 inches asphaltic
concrete

In summary, deflection analyses, trenching, coring, and visual inspection apparently indicate a strong base layer but significantly deteriorated asphaltic concrete layer. Much of the deterioration is limited to the upper 2 to 3 inches of the asphaltic concrete. The nature of the deterioration is suspected of being related to fatigue due to loading and also due to aging of the asphaltic concrete layer. Therefore, these recommendation for overlay thickness requirements rehabilitation strategies are respectfully submitted.

Summary of Deflection Analyses and Overlay Thickness Design Recommendations -- Purchase Parkway MP 0+00 to MP 8+34

MILEPOINTS					EFFECTIVE BEHAVIOR					
BEGIN	END	DIRECTION	LANE	DATE OF TEST	CBR (%)	THICKNESS OF REFERENCE AC (INCHES)	ESTIMATED DETERIORATION (%)	EIGHT YEAR EAL's	CALCULATED OVERLAY THICKNESS (INCHES)	RECOMMENDED OVERLAY THICKNESS (INCHES)
Section A										
0+00	3+41	North	Outside	7-84	6.99	3.82	41.2	1.10×10^6	1.90	2.1
0+00	3+41	North	Inside	7-84	6.38	4.80	26.2	1.10×10^6	1.15	2.1
0+00	3+41	South	Outside	7-84	5.37	3.72	42.7	1.10×10^6	2.89	3.1
0+00	3+41	South	Inside	7-84	6.17	4.00	38.5	1.10×10^6	1.98	3.1
Section B										
3+41	5+90	North	Outside	7-84	8.12	3.84	40.9	1.10×10^6	2.52	2.5
3+41	5+90	North	Inside	7-84	9.27	4.60	29.2	1.10×10^6	1.79	2.5
3+41	5+90	South	Outside	7-84	4.95	4.06	37.5	1.10×10^6	3.15	3.1
3+41	5+90	South	Inside	7-84	6.68	4.22	35.1	1.10×10^6	2.94	3.1
Section C										
5+90	8+35	North	Outside	7-84	6.01	3.35	48.5	1.10×10^6	3.12	3.5
5+90	8+35	North	Inside	7-84	6.74	4.12	36.6	1.10×10^6	3.42	3.5
5+90	8+35	South	Outside	7-84	6.61	3.78	41.8	1.10×10^6	3.04	3.1
5+90	8+35	South	Inside	7-84	7.30	4.67	28.2	1.10×10^6	2.42	3.1

APPENDIX IV
Project Construction Records



FLOYD G. POORE
SECRETARY

COMMONWEALTH OF KENTUCKY
TRANSPORTATION CABINET
FRANKFORT, KENTUCKY 40622

MARTHA LAYNE COLLINS
GOVERNOR

July 12, 1984

STEPHEN REFFER
DEPUTY SECRETARY AND
COMMISSIONER OF HIGHWAYS

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DEPUTY SECRETARY/COMMISSIONER
DEPT. OF VEHICLE REGULATION

ROBERT K. CAINO, P.E.
STATE HIGHWAY ENGINEER
DEPT. OF HIGHWAYS

ED SANS
PRINCIPAL ADMIN. ASSISTANT
OFFICE OF THE SECRETARY

PRISCILLA GERSHMAN
ADMINISTRATIVE ASSISTANT
OFFICE OF THE SECRETARY

LARRY E. MOORE
ADMINISTRATIVE ASSISTANT
OFFICE OF THE SECRETARY

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PRESS SECRETARY
OFFICE OF THE SECRETARY

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LOYEE ASSISTANCE
GRAM COORDINATOR
OFFICE OF THE SECRETARY

ROGER COLE
COMMISSIONER
DEPT. OF ADMINISTRATIVE SERVICES

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EXECUTIVE DIRECTOR
AERONAUTICS AND RIVERPORT DEV.

BETTY HAWKINS
EXECUTIVE DIRECTOR
OFFICE OF PERSONNEL MANAGEMENT

CYNTHIA NITZ RIS
EXECUTIVE DIRECTOR
OFFICE OF GENERAL COUNSEL

HARRY E. SYKES
EXECUTIVE DIRECTOR
OFFICE OF MINORITY AFFAIRS

Mr. J. H. Havens, Associate Director
Transportation Research Program
University of Kentucky
533 South Limestone Street
Lexington, Kentucky 40506-0043

Dear Mr. Havens:

SUBJECT: Jackson Purchase Parkway
Pavement Design

As discussed with you by phone this date, enclosed is a copy of the pavement design used on the subject project in 1966. The alternate of cement treated bank gravel shown on Sheet 2 of 3 was bid against dense graded aggregate shown on Sheet 3 of 3, and all projects utilized the cement treated bank gravel as opposed to DGA base.

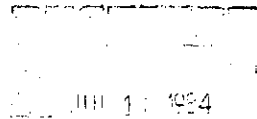
I also requested by phone that Bill Stutzenberger furnish you the total EAL's that have occurred on this Parkway since it was opened to traffic. He said he would contact you by phone.

I will supply you a copy of the FHWA itinerary as soon as it becomes available.

Sincerely,

E. B. Drake, Transportation
Engineering Branch Manager
Division of Design

Attachment
EBD:cjh



RECOMMENDATION FOR SURFACING DESIGN

County Fulton-Hickman-Graves-Marshall V/V/ JPP 111, 112, 113
 Road Name Jackson Purchase Parkway S.P. _____
 From A point in Ky. 116 west of Fulton on the Tennessee State Line
 To North end of JPP 113 approximately 0.5 mile south of Ky. 299 near
Station 2001+00
 Traffic: A.D.T. _____, 19____; _____, 19____. E.W.L. 40-80 Million
 Existing: Type Non-existing Thickness _____ inches
 Length 40.02 miles. Design CBR 6

SEE ATTACHED SHEET

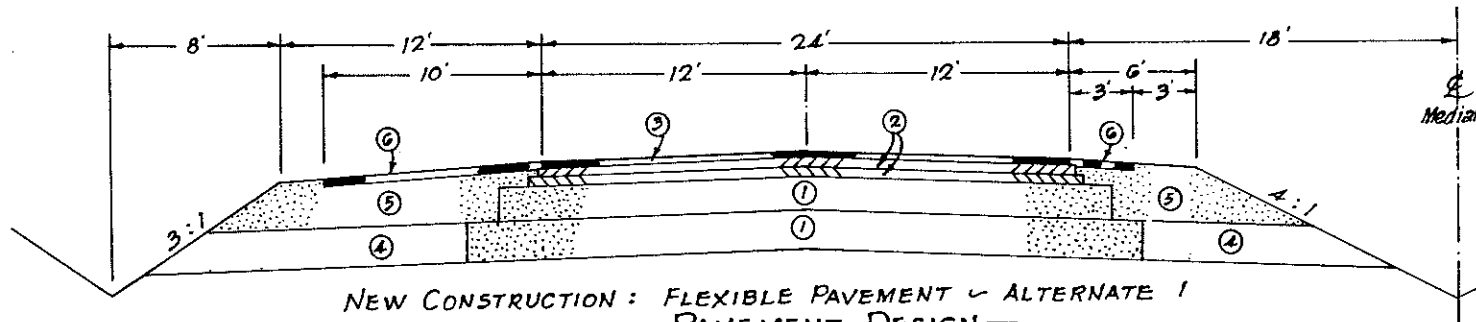
FOR PAVEMENT AND SHOULDER DESIGNS SEE ATTACHED SHEETS

Submitted by S T Collins, 7-1, 1966
 Recommended
 for Approval by E B Gaither, 7-1, 1966
 Dir., Division of Design
 Approved by L T Harker, 7-5, 1966
 Asst. State Highway Engineer
 for the Commissioner
 Approved by _____, _____, 19____
 For the Division Engineer (BPR)

JACKSON PURCHASE PARKWAY

BASED ON CBR 6 - EWL 40-80 MILLION

Sheet 2 of 3



NEW CONSTRUCTION : FLEXIBLE PAVEMENT - ALTERNATE 1
 — PAVEMENT DESIGN —

- ① 13" Compacted Cement Treated Bank Gravel (2-6 1/2" Courses) (2.5% by weight)
- ② 5" Compacted Bituminous Concrete Base, Class "I" (2-2 1/2" Courses)
- ③ 1 1/2" Compacted Bituminous Concrete Surface, Type "A", Class "I".
 0.10 Gal. per sq. yd. Tack Coat.

— SHOULDERS —

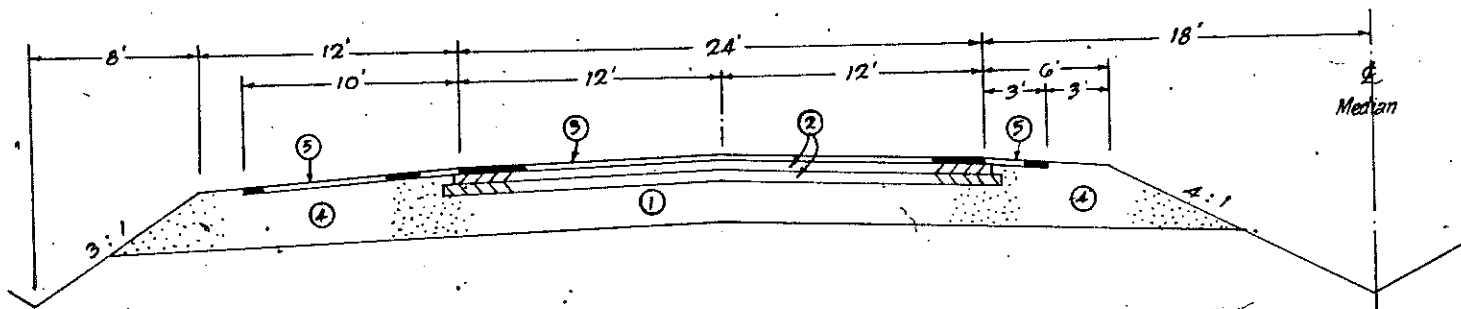
- ④ 6 1/2" Compacted Untreated Bank Gravel.
- ⑤ Variable Depth Compacted Cement Treated Bank Gravel. (2.5% by weight)
 0.25 Gal. per sq. yd. Prime Coat.
- ⑥ 1 3/4" Compacted Bituminous Concrete Surface, Type "A", Class "I"
 0.30 Gal. per sq. yd. Tack Coat
 20 Lbs. per sq. yd. Crushed Aggregate Size No. 9.

SCALE:
 1" = 5'-0" H.
 1" = 2.5' V.

prepared 5/10/60
 Div. of Design

JACKSON PURCHASE PARKWAY

BASED ON C.B.R. @ - EWL 40-80 MILLION



NEW CONSTRUCTION : FLEXIBLE PAVEMENT - ALTERNATE 2

- Approximately 18" Base — [1 3/4" ± Compacted Dense Graded Aggregate Base ①
5" ± Compacted Bituminous Concrete Base, Class I (2-2 1/2 Courses) ②]
- Tack Coat — [0.10 Gal. per sq. yd. Apply by fogging.]
- Approximately 1 1/2" Surface — [Compacted Bituminous Concrete Surface, Class I, Type "A" ③]
- Stabilized Shoulder — [Compacted Dense Graded Aggregate Base (as indicated) ④
0.25 Gal. per sq. yd. (Prime Coat)
1 3/4" ± Compacted Bituminous Concrete Surface, Class I, Type "A" ⑤
A-2 Seal — [0.30 Gal. per sq. yd. (Seal Coat)
20 Lbs. ± per sq. yd. Crushed Aggregate Size No. 20]

prepared 6/15/64
D.W. Design
SCM.



FLOYD G. POORE
SECRETARY

COMMONWEALTH OF KENTUCKY
TRANSPORTATION CABINET
FRANKFORT, KENTUCKY 40622

MARTHA LAYNE COLLINS
GOVERNOR

July 9, 1984

STEPHEN REEDER
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DEPUTY SECRETARY/COMMISSIONER
DEPT. OF VEHICLE REGULATION

ROBERT K. CARP, P.E.
STATE HIGHWAY ENGINEER
DEPT. OF HIGHWAYS

ED SAMS
PRINCIPAL ADMIN. ASSISTANT
OFFICE OF THE SECRETARY

PRISCILLA GERSHMAN
ADMINISTRATIVE ASSISTANT
OFFICE OF THE SECRETARY

LARRY E. MOORE
ADMINISTRATIVE ASSISTANT
OFFICE OF THE SECRETARY

MARY McDOWELL MULLOY
PRESS SECRETARY
OFFICE OF THE SECRETARY

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COMMISSIONER
DEPT. OF ADMINISTRATIVE SERVICES

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AERONAUTICS AND RIVERPORT DEV.

BETTY HAWKINS
EXECUTIVE DIRECTOR
OFFICE OF PERSONNEL MANAGEMENT

CYNTHIA N. RUS
EXECUTIVE DIRECTOR
OFFICE OF GENERAL COUNSEL

HARRY E. SYKES
EXECUTIVE DIRECTOR
OFFICE OF MINORITY AFFAIRS

Mr. Jim Havens
Associate Director
Kentucky Transportation Research Program
University of Kentucky
533 South Limestone
Lexington, Kentucky 40506-0043

Dear Mr. Havens:

Subject: Jackson Purchase
Parkway

Attached is information I was able to obtain from our old files on bituminous mix designs on some mixes for the Jackson Purchase Parkway work.

I was able to find laboratory mix design data for surface mixes on four of the projects, JPP 11, 12, 13 and 14. Apparently we were not performing laboratory mix design on base mixes at that time since most all the base was designed for 5.0 % design asphalt. Also included are several copies of asphalt plant mix field reports which are still on file in our office.

Very truly yours,

DIVISION OF MATERIALS

Larry Epley, P.E.
Materials Engineer
Branch Manager

LE:pm
cc: C. S. Layson
J. McChord
Attachment

Information From Field Reports

JPP 1-1, Hickman, Ken-Tenn, Columbus; Class I Binder

Coarse Aggr: SPR # 68
Fine Aggr: River Sand, Mfgd. Sand, Mineral Filler
Asphalt: 5%

JPP 1-1, Hickman-Fulton, Ken-Tenn, Columbus, Class I Base

Coarse Aggr: Cr. River Gravel, SPR # 57
Fine Aggr: Natural Sand and Mfgd. Sand, Filler
Asphalt: 5%

JPP 1-3, Fulton, Ken-Tenn, columbus, Class I Base

Coarse Aggr: SPR # 57, Cr. River Gravel
Fine Aggr: Natural Sand, Mineral Filler
Asphalt: 5%

JPP 2-2, JPP 1-2, JPP 2-1, Jpp 2-3, Graves, Ken-Tenn, Columbus, Class I Base

Coarse Aggr: SPR # 57, Cr. River Gravel
Fine Aggr: Natural, Mfgd. (Cr. Gravel), Mineral Filler
Asphalt: 5.0%

JPP 112-1, JPP 113-1, Graves, Warren Bros., Lake City, Class I Base

Coarse Aggr: Limestone
Fine Aggr: Natural River Sand and Mfgd. Limestone
Asphalt: 5.0%

JPP 113-2, Graves-Marshall, Warren Bros., Lake City, Class I Base

Coarse Aggr: Limestone
Fine Aggr: River Sand and Limestone Sand
Asphalt: 5.0%

JPP 114-2, Marshall, Warren Bros., Lake City, Class I Base

Coarse Aggr: Limestone, SPR 57
Fine Aggr: River Sand, Limestone Sand
Asphalt: 5%

JPP 1-1, Hickman-Fulton, Ken-Tenn, Columbus, Class I, Type A Surf.

Coarse Aggr: SPR # 8
Fine Aggr: River Sand, Mfgd Sand, Mineral Filler
Asphalt: 5.8%

JPP 1-2, JPP 2-1, JPP 2-2, Graves, Ken-Tenn, Columbus, Class I, Type A Surf.

Coarse Aggr: SPR # 8, Cr. River Gravel
Fine Aggr: Natural Sand and Mfgd. Sand, Filler
Asphalt: 5.8 %

JPP 112-2, JPP 113-1, Graves, Warren Bros., Lake City, Class I, Type A Surface

Coarse Aggr: Limestone
Fine Aggr: River Sand and Limestone Sand
Asphalt: 5.0%

JPP 113-2, Graves-Marshall, Warren Bros., Lake City, Class I, Type A Surf

Coarse Aggr: Limestone
Fine Aggr: River Sand and Limestone Sand
Asphalt: 5.9%

JPP 114-2, Marshall, Warren Bros., Lake City, Class I, Type A Surf

Coarse Aggr: # 9 Limestone
Fine Aggr: River Sand (Ingram) and Limestone Sand
Asphalt: 5.7%

Lab Mix Designs, 2-16-68, Class I, Type A, Surf.

JPP 1-3, JPP 11-1, Fulton, Fulton-Hickman, Ken-Tenn, McDade and McDade

Aggregate: 40% No. 8, Crushed Gravel, 43% Natural Sand,
5% Mineral Filler.
Asphalt: 6.0%
Stability: 810lbs.
Unit Wt.: 142.2pcf

JPP 11-2, JPP 12-1, JPP 12-2, Graves, Ballinger

Aggregate: 40% Limestone, 54% Washed Bank Sand, 6% Mineral
Filler.
Asphalt: 5.7%
Stability: 920lbs.
Unit Wt.: 144.8 pcf

APPENDIX V
Traffic History



FLOYD G. POORE
SECRETARY

COMMONWEALTH OF KENTUCKY
TRANSPORTATION CABINET
FRANKFORT, KENTUCKY 40622

MARTHA LAYNE COLLINS
GOVERNOR

July 19, 1984

STEPHEN REEDER
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DEPUTY SECRETARY/COMMISSIONER
DEPT. OF VEHICLE REGULATION

ROBERT K. CARPITO, P.E.
STATE HIGHWAY ENGINEER
DEPT. OF HIGHWAYS

ED SAMM
PRINCIPAL ADMIN. ASSISTANT
OFFICE OF THE SECRETARY

PRISCILLA GERSHMAN
ADMINISTRATIVE ASSISTANT
OFFICE OF THE SECRETARY

LARRY E. MOORE
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MARY MCDOWELL MULLOY
PRESS SECRETARY
OFFICE OF THE SECRETARY

DONALD W. JONES, JR.
EMPLOYEE ASSISTANT
PROGRAM COORDINATOR
OFFICE OF THE SECRETARY

ROGER COLE
COMMISSIONER
DEPT. OF ADMINISTRATIVE SERVICES

GEORGE T. WOLNITZER
COMMISSIONER
DEPT. OF FISCAL MANAGEMENT

ROBERT COX
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HARRY E. SYKES
EXECUTIVE DIRECTOR
OFFICE OF MINORITY AFFAIRS

Mr. J. H. Havens, Associate Director
Transportation Research Program
University of Kentucky
533 South Limestone Street
Lexington, Kentucky 40506-0043

Dear Jim:

Attached hereto is a copy of Mr. Ecton's letter of July 17, 1984, showing the calculations of the accumulative EAL's for the Fulton County portion of the Jackson Purchase Parkway from the State line to US 51.

This should be included in your summary of data in analyzing the effectiveness of the existing pavement.

Sincerely,

Gene Drake, Transportation
Engineering Branch Manager
Division of Design

Attachment
EBD:cjh



KENTUCKY TRANSPORTATION
RESEARCH PROGRAM
LEXINGTON, KY

6 - 1



FLOYD G. POORE
SECRETARY

COMMONWEALTH OF KENTUCKY
TRANSPORTATION CABINET
FRANKFORT, KENTUCKY 40622

MARTHA LAYNE COLLINS
GOVERNOR

MEMORANDUM

STEPHEN REEDER
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JOHN A. STEPHENSON, PH.D.
DEPUTY SECRETARY/COMMISSIONER
DEPT. OF VEHICLE REGULATION

ROBERT K. CARLIS, PE
STATE HIGHWAY ENGINEER
DEPT. OF HIGHWAYS

ED SAMS
PRINCIPAL ADMIN. ASSISTANT
OFFICE OF THE SECRETARY

PRISCILLA GERNHART
ADMINISTRATIVE ASSISTANT
OFFICE OF THE SECRETARY

LARRY E. MOORE
ADMINISTRATIVE ASSISTANT
OFFICE OF THE SECRETARY

MARY McDOWELL MULLOY
PRINCIPAL SECRETARY
OFFICE OF THE SECRETARY

ROGER COLE
COMMISSIONER
DEPT. OF ADMINISTRATIVE SERVICES

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COMMISSIONER
DEPT. OF PUBLIC MANAGEMENT

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COMMISSIONER
DEPT. OF PUBLIC MANAGEMENT

FRANK HARRIS
COMMISSIONER
DEPT. OF PUBLIC MANAGEMENT

JOHN HANCOCK
COMMISSIONER
DEPT. OF PUBLIC MANAGEMENT

FRANK E. MOORE
COMMISSIONER
DEPT. OF PUBLIC MANAGEMENT

TO: Larry Blevins, Director
Division of Design

ATTN: E. B. Drake

FROM: Donald L. Ecton, Director
Division of Planning

DATE: July 17, 1984

SUBJECT: Fulton County
Purchase Parkway
From Tennessee State Line
To US 51 North of Fulton

In accordance with your telephone request of W. J. Stutzenberger, our equivalent axle load estimates for the subject project follow:

YEAR	ADT	EAL'S PER LANE	
		ANNUAL	CUMULATIVE
1969	800	23,314	23,314
1970	1,000	36,538	59,852
1971	1,136	29,090	88,942
1972	1,410	47,453	136,395
1973	1,580	54,349	190,744
1974	1,770	72,678	263,422
1975	1,936	85,120	348,542
1976	2,834	103,852	452,394
1977	3,601	113,463	565,857
1978	3,500	110,107	675,964
1979	3,450	102,574	778,538
1980	3,364	75,970	854,508
1981	4,153	92,507	947,015
1982	4,700	259,606	1,206,621
1983	5,265	270,395	1,477,016

MEMO TO: Larry Blevins
DATE: July 17, 1984
Page Two.

Truck percentages used in estimating the EAL's were obtained by combining quarterly vehicle classification counts taken at our truck weigh station located on US 51 north of Fulton and classification data obtained from the Wingo Toll Plaza on the Purchase Parkway. The number of axles per truck and the axle loadings were obtained from data collected at the truck weigh station on US 51.

DLE/DS:pgh

APPENDIX VI
Specifications

COMMONWEALTH OF KENTUCKY
DEPARTMENT OF HIGHWAYS

SPECIAL PROVISION NO. 38

FOR

BANK GRAVEL SURFACE AND BASE COURSES

This Special Provision shall be applicable only when indicated on the plans or in the proposal and, when so indicated, shall supersede any conflicting provisions of the Department's Standard Specifications.

I. DESCRIPTION

This work shall consist of the construction of traffic-bound bank gravel surfaces or bank gravel bases or both, as specified, upon a prepared subgrade or existing traffic-bound surface to the lines, grades, and thicknesses specified or directed; all in accordance with the provisions set out hereinafter.

II. MATERIALS

A. General. The bank gravel, in its natural deposit, shall consist of coarse aggregate, fine aggregate, and soil fines. The soil fines shall be that portion passing the No. 40 sieve, and shall be free of materials detrimental to its binding qualities.

B. Approval of Source. Prior approval of the source shall be received from the Division of Materials for each contract, before construction operations are begun. The request for approval of the source shall be submitted at least two weeks in advance of operations.

C. Properties. The bank gravel shall meet the following requirements:

Soundness (5 alternations) max. pct. weighted loss.....	15
Wear (L.A. Abrasion) max. pct. loss by weight.....	35
Clay, max. pct. (particle size less than .005 mm).....	10
Clay plus P.I., max.....	25

The P.I. shall be determined as described in the Division of Materials Soil Manual on material passing the No. 40 sieve.

Gradation:

<u>Sieve Size</u>	<u>Per Cent Passing</u>
2-inch	100
No. 4	25-65
No. 40	6-30
*No. 100	5-20

*Per Cent passing Size No. 100 shall be determined by laboratory wash test only (AASHTO T11).

D. Sampling and Testing. Field tests for gradation shall be made and reported two times for each full day of operation or oftener, as deemed necessary by the Engineer to insure control. Field tests will be required only over Sieve Sizes 2-inch, No. 4, and No. 40 and the results shall be within the limits given in the foregoing table for the corresponding sieves. Sampling and Testing shall be done in accordance with the applicable standards adopted by the Department.

E. Handling and Processing. The approved source shall be completely stripped of all overburden to a sufficient distance from the face of the pit to insure that none of the overburden material will become mixed with the bank gravel. Pockets of unacceptable material, if encountered, shall be removed and wasted before proceeding further with production.

If the composition of the bank gravel in its natural deposit satisfies all requirements as herein provided, then further processing will not be required.

In the event the bank gravel does not comply with the gradation requirements due to an excess or a deficiency in one or more fractions, then the gravel may be processed by screening or by adding approved materials, or both, in a manner satisfactory to the Engineer, so that the processed material will comply with all of the requirements set out herein.

No additional compensation will be allowed for any necessary processing of the material. Such work shall be incidental to the unit price bid for furnishing and placing the bank gravel.

III. CONSTRUCTION METHODS

A. Traffic-Bound Surfaces. The construction of traffic-bound bank gravel surfaces shall be done in accordance with the applicable provisions of Section 206 of the 1965 Standard Specifications.

B. Bases and Sub-Bases. Earth subgrades shall be prepared in accordance with Article 108.3.3 of the 1965 Standard Specifications.

The existing subgrade or traffic-bound surface shall be reshaped as necessary to provide a uniform grade and cross-section.

The bank gravel shall be spread uniformly over the prepared subgrade or existing traffic-bound surface to a loose depth sufficient to provide the specified compacted thickness of the course. Dumping in piles shall not be permitted.

Shaping by blading or dragging will be required by the Engineer before and during compaction, when deemed necessary to produce a uniform grade and section. The bank gravel base shall be compacted under controlled moisture conditions. Water shall be added by sprinkling when and as directed by the Engineer as necessary to maintain an optimum moisture content. Payment for water shall be included in the price bid for "Bank Gravel Base." Care shall be exercised to avoid the application of water in excess of that required to obtain maximum compaction.

Pneumatic-tired rollers will be required for the compaction of bank gravel bases and sub-bases. When the compacted depth of any one course exceeds 4 inches, a sheepfoot roller will be required to start the compaction with a pneumatic-tired roller used to complete the compaction. Finish rolling may be done by either a pneumatic-tired roller or a 3-wheel, 10-ton roller.

Prior to compaction of each course of the base, shoulder material shall be placed against the base course to a width of not less than 18 inches and of sufficient quantity that after compaction, the partial shoulder width shall conform to the height of the compacted base course.

The Contractor shall maintain the entire roadway within the limits of his contract, in a condition satisfactory to the Engineer, for the duration of the contract.

In the event operations are suspended due to weather or seasonal conditions before the bituminous surface has been placed, the Contractor shall maintain the base during the close-down period; and shall reshape and recompact the base, if considered necessary by the Engineer, before bituminous operations are begun or resumed. No additional payment shall be allowed for this maintenance.

V. MEASUREMENT AND PAYMENT

Unless otherwise provided, the bank gravel shall be weighed as provided in Article 1.9 1-F of the 1965 Standard Specifications.

The material thus measured, and accepted in place, will be paid for at the unit price bid per ton for "Bank Gravel," which payment

Page 4 of 4

will be full compensation for furnishing, hauling, and placing all materials, including water when required; for maintenance of base; and for all labor, equipment, tools, and incidentals necessary to complete the work.

APPROVED September 2, 1946

A. O. Neiser
A. O. NEISER
STATE HIGHWAY ENGINEER

COMMONWEALTH OF KENTUCKY
DEPARTMENT OF HIGHWAYS

SPECIAL PROVISION NO. 34

FOR

PLANT-MIXED, BANK GRAVEL BASE

These Provisions shall be applicable only when indicated on the plans or in the proposal and, when so indicated, shall supersede any conflicting provisions of the Department's Standard Specifications....

I. DESCRIPTION

This work shall consist of the construction of one or more courses of cement-treated or untreated bank gravel base, or both, as specified, upon a prepared subgrade and to the lines, grades, and thicknesses specified or directed -- all in accordance with the provisions set out hereinafter.

II. MATERIALS

A. Bank Gravel. The bank gravel, in its natural deposit, shall consist of coarse aggregate, fine aggregate, and soil fines. The soil fines shall be that portion passing the No. 40 sieve, and shall be nominally free of materials detrimental to its binding qualities.

1. Approval of Source. Prior approval of each source shall be obtained from the Division of Materials before construction operations are begun. The request for approval of the source shall be submitted at least two weeks in advance of operations.

2. Properties. The bank gravel shall meet the following requirements:

Soundness (5 alternations, max. pct. weighted loss)...	15
Wear (L.A. Abrasion, max. pct. loss by weight).....	35
Clay, max. pct. (particle size less than .005 mm).....	10
Clay plus P.I., max.....	25

The P.I. shall be determined as described in the Division of Materials Soil Manual on material passing the No. 40 sieve.

Gradation:

<u>Sieve Size</u>	<u>Per Cent Passing</u>
2-inch	100
No. 4	25-65
No. 40	6-30
*No. 100	5-20

*Per Cent passing Size No. 100 shall be determined by laboratory wash test only (AASHTO T11).

3. Sampling and Testing. Field tests for gradation shall be made and reported two times for each full day of operation or oftener, as deemed necessary by the Engineer to insure control. Field tests will be required only over Sieve Sizes 2-inch, No. 4, and No. 40 and the results shall be within the limits given in the foregoing table for the corresponding sieves. Sampling and Testing shall be done in accordance with the applicable standards adopted by the Department.

4. Handling and Processing. The approved source shall be completely stripped of all overburden to a sufficient distance from the face of the pit to insure that none of the overburden material will become mixed with the bank gravel. Pockets of unacceptable material, if encountered, shall be removed and wasted before proceeding further with production.

In the event the bank gravel does not comply with the gradation requirements, due to an excess or a deficiency in one or more fractions, then the gravel may be processed by screening, crushing, or by adding approved materials, or both, in a manner satisfactory to the Engineer, so that the processed material will comply with all of the requirements set out herein. No additional compensation will be allowed for any necessary processing of the material. Such work shall be incidental to the unit price bid.

B. Portland Cement. Cement, when required, shall satisfy the requirements of Section 601 of the Standard Specifications for Type I.

C. Water. Water shall be furnished from a source approved by the Engineer and shall comply with the requirements of Section 603 of the Standard Specifications.

III. CONSTRUCTION METHODS

A. Subgrades. Subgrades shall be prepared in accordance with Article 208.3.1 of the Standard Specifications.

B. Shoulders. Shoulders shall be constructed in accordance with the applicable requirements of Section 109 of the Standard Specifications.

C. Base.

1. Proportioning and Mixing. The bank gravel, water, and portland cement when required shall be metered together and uniformly regulated so as to yield a mixture containing the specified proportions. The cement shall be proportioned to yield 2.5 ± 0.5 per cent by weight of bank gravel (wet basis at optimum moisture content). Water shall be proportioned to yield the moisture content satisfactory to obtain the required density.

The mixer shall be a twin-shaft pugmill or other mixing plant approved by the Engineer. The water-feed system shall be equipped with a flow meter and a regulator. The rate of input shall be adjusted by the Engineer to compensate for indigenous moisture in the gravel supply.

2. Transporting. Cargo boxes of the transport vehicles shall be covered with heavy canvas in order to minimize loss of moisture from the mixture while enroute.

3. Placing, Spreading and Shaping. The subgrade shall be dampened slightly just before the treated bank gravel mixture is placed. The mixture shall be placed, spread to a preset, stringlined grade and shaped without causing segregation; powered equipment shall be operated so as to produce the desired compacted depth, grade, and cross-section shown on the plans or in the proposal. No cement treated material shall be discharged from the truck into the spreading equipment after 2 hours from the time of mixing.

When more than one course of cement-treated bank gravel base is required, the succeeding course shall be placed and compacted within 6 hours after the incorporation of cement into the mix for the preceding course. Time limitations do not apply to untreated bank gravel base courses.

4. Compaction. Each course of the base shall be compacted to not less than 98 per cent of maximum density as determined by AASHTO T 134 for cement treated base courses and by AASHTO T 99 for untreated base courses. One density test shall be made at each interval of 1000 feet; additional tests may be required. The in-place density shall be determined by the rubber-balloon method, ASTM D 2167.

compacting equipment shall be subject to the approval of the Engineer and shall be capable of effecting the specified density

throughout the depth of the course. The compacted layer-depth shall not exceed 8 inches nominally. Wetting of a course to aid compaction shall not be permitted without manipulation in place as directed by the Engineer. Reshaping or other disturbances to cement treated base courses shall not be allowed after 4 hours have elapsed from the time of incorporation of cement, nor in any case after application of asphalt prime coat. Hand tampers may be required at areas inaccessible to larger equipment.

5. Curing. The compacted cement treated base shall be primed with not less than 0.20 gallons of SS-1h, asphaltic emulsion per square yard (Article 621.6.0) before the onset of drying and within the 24 hours after placement. The prime coat shall be applied in accordance with Section 301 of the Standard Specifications. The sand blotter course, when required by the Engineer, shall be spread immediately thereafter. The spreader shall conform to Article 302.3.2-E. The sand shall be applied at a rate of not less than 5 pounds per square yard.

Curing will not be required for untreated bank gravel base courses.

Traffic shall be prohibited from traveling over the completed cement treated base for at least 14 days following placement. Any damage arising from the use of the finished base shall be repaired at the Contractor's expense prior to paving.

6. Surface Tolerances. The surface of the finished base shall not deviate more than 1/2 inch from the crown template nor more than 3/8 inch in 10 feet when measured longitudinally. Intolerable deviations shall be corrected by the Contractor without additional compensation; such work shall consist of leveling with Class I, Type A, Bituminous Concrete Surface mixture (Section 306 of the Standard Specifications) following curing of the base.

IV. METHOD OF MEASUREMENT

Water used in the mixing of the base and conditioning the subgrade will not be measured for payment.

A. The plant-mixed cement-treated base materials will be measured in tons in accordance with Article 1.9.1-F.

B. The plant-mixed untreated base materials will be measured in tons in accordance with Article 1.9.1-F.

C. The portland cement admixture will be measured in barrels (376 pounds per barrel) in accordance with Article 1.9.1-F.

D. The actual quantity of bituminous material applied will be measured according to Section 621 of the Standard Specifications.

E. Sand aggregate for blotter material will be measured in tons in accordance with Article 1.9.1-F. Material wasted shall be estimated by the Engineer and deducted from the measured quantity.

F. Sand for lateral drains under shoulders, when required, (Article 109.3.0) will be measured in tons in accordance with Article 1.9.1-F.

V. BASIS OF PAYMENT

The quantities thus measured and accepted shall be paid for as follows:

A. Cement-Treated Bank Gravel at the unit price bid per ton of mixture -- less calculated deduction for portland cement admixture.

B. Untreated Bank Gravel at the unit price bid per ton of mixture.

C. Portland Cement admixture at the unit price bid per barrel.

D. Bituminous Material at the contract unit price bid per gallon.

E. Sand Aggregate at the contract unit price bid per ton.

F. Aggregate for lateral drains at the contract unit price per ton bid for untreated gravel.

Such payments shall be full compensation for furnishing and hauling all materials, processing and completing the base, and for furnishing all items incidental thereto.

APPROVED June 28, 1966

A. O. Neiser
A. O. NEISER
PROJECT MANAGEMENT ENGINEER

APPENDIX VII
Correspondence



FLYNN, FLORE
ST. LOUIS

COMMONWEALTH OF KENTUCKY
TRANSPORTATION CABINET
FRANKFORT, KENTUCKY 40622

MARTHA LAYNE COLLINS
GOVERNOR

August 2, 1984

STEVEN R. DEEN
DIRECTOR, TRANSPORTATION
RESEARCH PROGRAM

DR. R. C. DEEN
DIRECTOR, TRANSPORTATION
RESEARCH PROGRAM

JERRY A. STEPHENSON, PH.D.
DIRECTOR, TRANSPORTATION
RESEARCH PROGRAM

R. BRYAN CALTOPE
STATE HIGHWAY ENGINEER
DIVISION OF HIGHWAYS

ET. SAM
STATE HIGHWAY ENGINEER
DIVISION OF HIGHWAYS

FRANK A. GERHART
ADMINISTRATIVE ASSISTANT
DIVISION OF HIGHWAYS

LARRY E. MURPHY
ADMINISTRATIVE ASSISTANT
DIVISION OF HIGHWAYS

MARSHALL M. MURPHY
ADMINISTRATIVE ASSISTANT
DIVISION OF HIGHWAYS

FRANK A. GERHART
ADMINISTRATIVE ASSISTANT
DIVISION OF HIGHWAYS

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FRANK A. GERHART
ADMINISTRATIVE ASSISTANT
DIVISION OF HIGHWAYS

Dr. R. C. Deen, Director
Kentucky Transportation Research Program
College of Engineering
University of Kentucky
533 South Limestone
Lexington, Kentucky 40506-0043

Dear Dr. Deen:

Subject: Impromptu Investigation of
Jackson Purchase Parkway,
Mayfield ByPass and Fulton
ByPass

On June 28, I requested that you have Mr. Havens
do an impromptu investigation of existing field conditions
on the Jackson Purchase Parkway, Mayfield ByPass, and
Fulton ByPass prior to a meeting with representatives of
the Federal Highway Administration.

Since the meeting with the FHWA, based on both our
observations and their recommendations, it has been
decided that further investigation should be made of both
the bituminous base and cement treated base, particularly,
on the Fulton ByPass.

As I discussed with you yesterday and with Mr. Havens
today, we would like to add to the impromptu investigation
the taking of some additional cores from each section of
the Jackson Purchase Parkway to represent both locations
where there is considerable cracking and locations where
the pavement appears to be in good or better condition.

In addition, as I told Mr. Havens, I would like for
him to coordinate with Harrison Evans in the Division of
Maintenance for trench sections to be excavated and studied
at the location near the Hickman County line where the
type of bituminous construction changes from a limestone
blend to 100 percent river gravel - with at least one section
from each type construction. If deemed necessary by
Mr. Havens, a trench section may also be taken at the south

Dr. R. C. Deen
Page Two
August 2, 1984

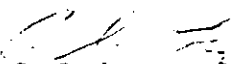
end of the Parkway at one of the locations where cracking is most apparent.

Please have Mr. Havens contact Harrison Evans to make arrangements for the necessary support from Maintenance personnel.

Maintenance should be able to charge their costs against the design project even though the trench sections are located outside the federal-aid portion as this data is being gathered to prepare design for the Fulton federal-aid project. Research can charge their effort as an impromptu investigation.

Please have the Transportation Research Program furnish the Department a recommendation as soon as possible of the measures they recommend to rehabilitate the pavement on the south end of the Jackson Purchase Parkway (federal-aid portion).

Very truly yours,


C. S. Layson, P.E.
Assistant State Highway Engineer
Administration and Research

CSL:bj
cc: R. K. Capito
B. L. Wheat
Larry Blevens
George Ashbury
Gene Drake
Harrison Evans
John Puryear



FLOYD G. POORE
SECRETARY

COMMONWEALTH OF KENTUCKY
TRANSPORTATION CABINET
FRANKFORT, KENTUCKY 40622

MARTHA LAYNE COLLINS
GOVERNOR

July 25, 1984

STEPHEN REEDER
DEPUTY SECRETARY AND
COMMISSIONER OF HIGHWAYS

OTTO INGRAM
DEPUTY SECRETARY/COMMISSIONER
DEPT. OF RURAL & MUNICIPAL AID

JOHN A. STEPHENSON, Ph.D.
DEPUTY SECRETARY/COMMISSIONER
DEPT. OF VEHICLE REGULATION

ROBERT K. CAPITO, P.E.
STATE HIGHWAY ENGINEER
DEPT. OF HIGHWAYS

ED SAMS
PRINCIPAL ADMIN. ASSISTANT
OFFICE OF THE SECRETARY

PRISCILLA GERGHMAN
ADMINISTRATIVE ASSISTANT
OFFICE OF THE SECRETARY

LARRY E. MOORE
ADMINISTRATIVE ASSISTANT
OFFICE OF THE SECRETARY

MARY McDOWELL MULLOY
PRESS SECRETARY
OFFICE OF THE SECRETARY

DOUGLAS W. JONES, JR.
EMPLOYEE ASSISTANCE
PROGRAM COORDINATOR
OFFICE OF THE SECRETARY

ROGER COLE
COMMISSIONER
DEPT. OF ADMINISTRATIVE SERVICES

GEORGE T. WOLNITZKE
COMMISSIONER
DEPT. OF FISCAL MANAGEMENT

ROBERT COX
EXECUTIVE DIRECTOR
AERONAUTICS AND RIVERPORT DEV.

BETTY HAWKINS
EXECUTIVE DIRECTOR
OFFICE OF PERSONNEL MANAGEMENT

CYNTHIA NITZ RIG
EXECUTIVE DIRECTOR
OFFICE OF GENERAL COUNSEL

HARRY E. SYKES
EXECUTIVE DIRECTOR
OFFICE OF MINORITY AFFAIRS

Mr. R. E. Johnson
Division Administrator
Federal Highway Administration
330 West Broadway
Frankfort, Kentucky 40601

Dear Mr. Johnson:

Subject: FHWA Pavement Rehabilitation and
Design Team Visit to Kentucky
Jackson Purchase Parkway

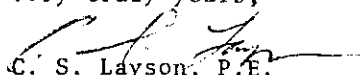
Your office has furnished us an itinerary for the visit of the FHWA rehabilitation and design team. This team is due to be in Kentucky on July 30 and August 1, 1984. The purpose of their visit is to review, discuss, and develop procedures for rehabilitating sections of the Jackson Purchase Parkway (Tennessee Line to KY 307) and other sections of highway that are severely cracked and usual procedures of rehabilitation have not been successful. Also, as you know, they plan to review the "cracking and seating" of PCC pavement and overlaying with asphaltic concrete.

For your information, I am having hand-carried to your office this date, ten copies of a report entitled JACKSON PURCHASE PARKWAY PAVEMENT STUDY. This report was prepared on July 24, 1984 by James H. Havens, Associate Director of the Transportation Research Program at the University of Kentucky.

I am also having copies of this report hand-carried to the Department's representatives - other than the district personnel - who plan to be present for the field inspection of the Jackson Purchase Parkway on July 30.

Please take the necessary action to get copies of this report to the members of the FHWA's review team as soon as possible.

Very truly yours,


C. S. Layson, P.E.
Assistant State Highway Engineer
Administration and Research

Mr. R. E. Johnson
Page Two
July 25, 1984

cc: R. K. Capito w/att.
B. L. Wheat w/att.
A. B. Magee w/att.
L. S. Blevins w/att.
E. B. Drake w/att.
R. D. Evans w/att.
John McChord w/att.
Harrison Evans w/att.
John Puryear w/att.
D. O. Sullivan w/att.
FHWA File



FLOYD G. POORE
SECRETARY

COMMONWEALTH OF KENTUCKY
TRANSPORTATION CABINET
FRANKFORT, KENTUCKY 40622
July 18, 1984

MARTHA LAYNE COLLINS
GOVERNOR

STEPHEN REEDER
DEPUTY SECRETARY AND
COMMISSIONER OF HIGHWAYS

OTTO KOGAN
DEPUTY SECRETARY/COMMISSIONER
DEPT. OF RURAL & MUNICIPAL AFF.

JOHN A. STEPHENSON, PhD
DEPUTY SECRETARY/COMMISSIONER
DEPT. OF VEHICLE REGULATION

ROBERT K. CARPIS, PE
STATE HIGHWAY ENGINEER
DEPT. OF HIGHWAYS

ED SAM
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CYNTHIA NITZ RIS
EXECUTIVE DIRECTOR
OFFICE OF GENERAL COUNSEL

HARRY E. SYKES
EXECUTIVE DIRECTOR
OFFICE OF MINORITY AFFAIRS

Mr. J. H. Havens, Associate Director
Transportation Research Program
University of Kentucky
533 South Limestone Street
Lexington, Kentucky 40506-0043

Dear Jim:

SUBJECT: Jackson Purchase Parkway
(Fulton County)

As discussed with you by phone, transmitted herewith is a copy of Ed Minter's recommendation dated May 3, 1984, on the treatment of the federally eligible portion of the subject Parkway. This recommendation, of course, is to be considered for use in your presentation to the Federal people at our proposed meeting with them at 2 PM Monday, July 30, 1984, in Mayfield

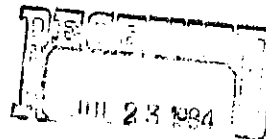
Sincerely,

Gore

E. B. Drake, Transportation
Engineering Branch Manager
Division of Design

Attachment
EBD:cjh

cc: Ed Minter



KENTUCKY TRANSPORTATION
DIVISION OF DESIGN
LEXINGTON, KY

MEMORANDUM

TO: John Puryear
District Engineer
District #1, Paducah

FROM: John E. McChord
Director
Division of Materials

BY: Ed Minter, Chief Chemist

DATE: May 3, 1984

SUBJECT: Mayfield By-Pass and Purchase Parkway
or Other Cracked Pavement Due To Be Resurfaced

On April 25, 1984 Marshall Bobo and I looked at the stretch of pavement placed last year that has already reflected the underlying cracks. The cracks are expected to spall very quickly and will, if not corrected, result in an even wider crack than was originally covered up.

I recommend a polymerized RS-2 emulsion be used to treat each crack that presently can be seen. A light application of sand or some other fine, clean aggregate be used to cover the treated crack. Dust or material finer than the #50 screen should be avoided since this type material would tend to deaden the cured residue and reduce its effectiveness at sealing the cracks. After 3-4 weeks any reappearing cracks should be treated again.

At the end of the above described section is a stretch of the Bypass approximately 1/4 mile long that I would like to see treated in the following manner. At present the surface has numerous random or alligator type cracks. To seal each individual crack would require much labor, routing equipment, and traffic delays. The first step recommended would involve a quick pass by a distributor with one man applying polymerized RS-2 over the largest cracks. A light dusting of sand would be applied to reduce pick-up. The second step would require an even distribution of polymerized RS-2 at a rate of .35 gallon per square yard. Immediately behind the distributor a 9 M chip seal aggregate (or larger) would be applied 1 stone thick. Extreme care should be exercised to assure that the aggregate be applied immediately behind the distributor.

No excess aggregate should be applied since all excess aggregate should be removed prior to the next step. Excess aggregate causes an uncoated interface between the RS-2 polymer emulsion and the next layer, the selected hot mix. Some asphalt should be visible between the chip particles to assure continuity of the asphalt phase. The chip seal mat must be rolled by a pneumatic tired roller immediately behind the chip spreader. Another way to assure asphalt continuity is to pre-coat the chip aggregate with a small percent of AC-20. Dust and moisture problems could also be controlled by running the chip through a hot mix plant.

Continued
Page -2-

An asphalt content of .5-1% would be sufficient to insure continuity of the asphalt phase and reduce the effect of dust. Complete coating is not desired because the chip must not cling together during hauling and spreading.

I recommend that 1" of surface mix or 1½" of binder be placed on the chip seal mat.

The cost of the RS-2 polymerized emulsion should be from \$.80 to 1.00 per gallon. This would be \$.28 to .35 per square yard. Since the aggregate would not be required to be a skid resistant aggregate because it is to be covered up it should be very economical. The application weight of chip aggregate will vary depending on the size but generally 20 to 25 pounds of chip per square yard will be sufficient. The cost should not exceed \$.05-.08 per square yard. The hot mix should cost approximately \$1.25-1.75 per square yard. The total cost should not be more than 1.75 to 2.25 per square yard. If coated chip aggregate is used the cost of the chip would of course be more but I feel it would be well worth the extra lost.

JEM:EM:vjs

Kentucky - Pavment Rehabilitation and
Design Team Visit (July 30 - August 1, 1984)

July 11, 1984

Division Administrator
Frankfort, Kentucky

HEC-KY

HRA-04

Mr. Leon Larson, Regional
Federal Highway Administrator
Atlanta, Georgia

Attached for your information is an itinerary for the subject
Rehabilitation and Design Team's visit to Kentucky. We have, also,
attached a copy of our letter to the Kentucky Transportation Cabinet
which confirms the visit and requests certain information for con-
sideration by the team prior to their visit.

Lodging reservations have been made at the designated motels for all
FHWA personnel listed on the itinerary.

Please advise of any changes in plans that would affect the visit and
itinerary. We have provided copies of this memorandum with attachments
to the three team members.

J. W. Hilborn III
Robert E. Johnson

Attachments

cc: Reuben Thomas, HNG-23, w/attachments
Paul Teng, HNR-20, w/attachments
Dick McComb, HNR-20, w/attachments
✓ Gene Drake, KYTC, C/O
Tom Pilling; Bob Payne

JWHilborn:bb

7-13-84

ENDORSEMENT TO: Jim Havens-w/a ✓
Larry Epley-w/a
Harrison Evans-w/a
Cy Layson-w/a

This is to request that you or someone from your office be present for this
field inspection of the Fulton Bypass. Please advise me or John Puryear for room
reservations at the Holiday Inn in Mayfield, Monday July 30.

Gene
Gene Drake -



U.S. Department
of Transportation
**Federal Highway
Administration**

Kentucky Division Office

330 West Broadway
Frankfort, Kentucky 40601

IN REPLY REFER TO: HEC-KY

July 11, 1984

Dr. Floyd Poore, Secretary
Kentucky Transportation Cabinet
Frankfort, Kentucky

Dear Dr. Poore:

Subject: Kentucky - Pavement Rehabilitation and Design
Team Visit (Jackson Purchase Parkway in
Fulton County)

This is in response to your June 7, 1984, letter which requested assistance from our Pavement Rehabilitation Design Team in proposing rehabilitation measures for portions of the Purchase Parkway in Fulton County.

The three-man team will arrive in Kentucky on Monday, July 30, 1984, to provide the requested assistance. They, also, would like to observe a 3R project where concrete is being "cracked and sealed" and overlayed with asphaltic concrete in the Louisville area. The itinerary for the visit of the design team, as developed in cooperation with Mr. Gene Drake, is enclosed.

The design team would like to receive any information that is available on the existing pavement and its associated problem prior to their visit. This should include, to the extent available, a typical section; pavement design; history of pavement; results of any tests or corings; slides or pictures; and measures tried with results.

We will continue to coordinate the visit of the Rehabilitation and Design Team with Mr. Drake. The KYTC may, also, want to discuss and/or review other pavement problems and concerns with the team when they are in Kentucky. The itinerary provides time on Wednesday, August 1, for additional considerations.

Sincerely yours,

James W. Hilborn III

For: Robert E. Johnson
Division Administrator

Enclosure

cc: Messrs. Leon Larson, FHWA, R/O;
Rueben Thomas; Paul Teng; Dick McComb, FHWA, W/O
✓ Gene Drake, KYTC, C/O
John Puryear, KYTC, Dist. 1
William Monhollon, KYTC, Dist. 5

ITINERARY
FHWA PAVEMENT REHABILITATION AND DESIGN TEAM
VISIT TO KENTUCKY
July 30 - August 1, 1984

Purpose of Visit:

To review, discuss and develop procedures for rehabilitating sections of the Jackson Purchase Parkway (Tennessee Line to KY 307) and other sections of highway that are severely cracked and usual procedures of rehabilitation have not been successful. Also, to review the "cracking and seating" of P.C.C. pavement and overlaying with asphaltic concrete.

Participants:

FHWA

Reuben Thomas (W.O.)	Norm VanNess (R.O.)(?)
Paul Teng (W.O.)	Jim Hilborn (KY Division)
Dick McComb (W.O.)	Tom Pilling (KY Division)
	Bob Payne (KY Division)

KENTUCKY TRANSPORTATION CABINET

Gener Drake	John Puryear
Others	

MONDAY, July 30

- FHWA R and D Team and R/O representative arrives Paducah, KY, at 1:00 p.m. CDT via AL1824.
- FHWA D.O. Representatives and KYTC representatives meet visitors at airport and travel to Mayfield, Kentucky, for introduction and discussion at Resident Engineer's office. (At the Mayfield Maintenance Garage).
- Review recently completed 4R project on Mayfield Bypass and other sections of highways where cracking of the surface has been a problem.
- Lodging: Holiday Inn - Mayfield, Kentucky
Jackson Purchase Parkway & US 45 Bypass at KY 121
Phone No. (502) 247-3700

-more-

TUESDAY, July 31

- Travel to Fulton County and review proposed 4R project (Free section of the Jackson Purchase Parway from Tennessee line to KY 307) which has extensive cracking in the existing surface and possibly the base.
- Travel to KYTC District 1 office near Paducah for closeout conference.
- FHWA personnel and KYTC representatives leave Paducah at 4:00 p.m. CDT via AL1817.
- Arrive Louisville at 5:55 p.m. EDT.
- Limo to motel.
- Lodging: Howard Johnson's Motor Lodge
4621 Shelbyville Highway
Louisville, Kentucky
Phone No. (502) 896-8871

WEDNESDAY, August 1

- Above group met at motel by FHWA Area Engineer and KYTC District Office personnel and transported to review sites.
- Review "cracking and seating" of P.C.C. pavement and asphalt concrete paving operation on I-71.
- Review and discuss other pavement rehabilitation and construction activities as time and interest permits.
- FHWA R and D Team leave Louisville at 4:15 p.m. EDT via AL398.
- FHWA R/O representative leaves Louisville at 5:30 p.m. EDT via DL1537.

10-10
Cg Layson

RECEIVED
JUN 20 1984

MEMORANDUM

TO: C. S. Layson, Assistant
State Highway Engineer
for Administration and Research

FROM: Lawrence S. Blevins, Director
Division of Design

DATE: June 25, 1984

SUBJECT: Jackson Purchase Parkway
Mayfield Bypass and
Fulton Bypass

RECEIVED BY
C. S. LAYSON

JUN 20 1984

ASST. ST. HIGHWAY ENGINEER
FOR ADMINISTRATION

LSB

The Jackson Purchase Parkway was constructed initially with the larger portion utilizing cement treated bank gravel base and a significant research effort was put forth to arrive at that design.

Due to the reflective cracking of the Bituminous Class A Mix on the Mayfield Bypass, principally in the northbound lanes, and a proposal to pave the toll free portion of the Fulton Bypass, a concern of appropriate design is paramount.

I know you have recently visited the route. Attached is recent correspondence whereby we have requested assistance from experts of the FHWA. We anticipate a review by their pavement rehabilitation and design team along toward the later part of July. The purpose of this memo is to request that you authorize Mr. Havens to do an impromptu investigation of existing field conditions prior to meeting with Design, Materials, Maintenance and FHWA. Mr. Epley of Materials has visited the route recently and Mr. Havens wants to do so.

Your early approval of this proposal will allow us to gather sufficient information prior to meeting with affected parties.

Attachments
LSB:EBD:cjh
cc: R. K. Capito
G. M. Kelly
A. R. Romine
George Asbury
Larry Epley
Jim Havens
Jim Hilborn

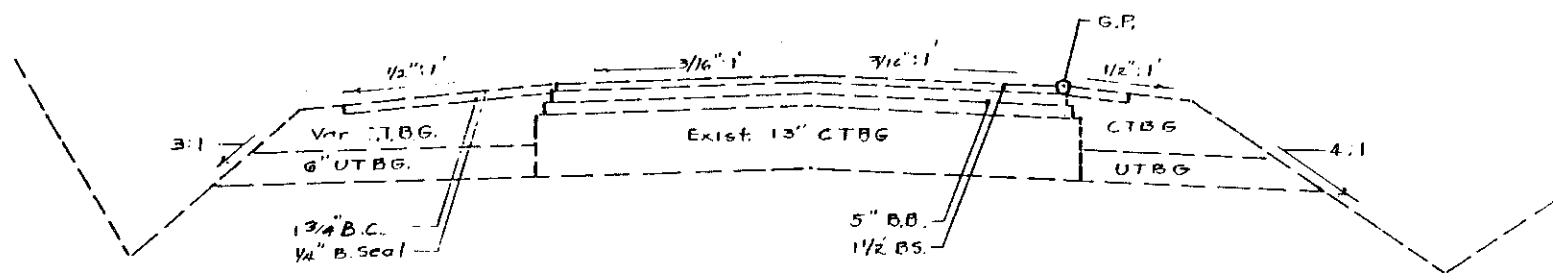
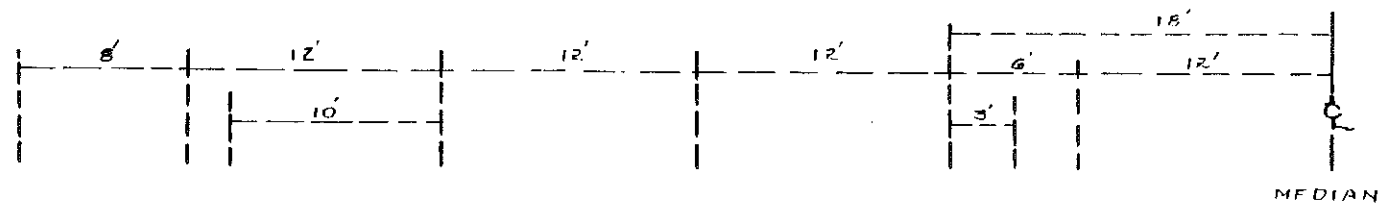
ENDORSEMENT TO: Bob Deen

June 28, 1984

Please proceed to have Mr. Havens do the impromptu investigation of existing field conditions on the Jackson Purchase Parkway, Mayfield ByPass and Fulton ByPass prior to a meeting that will be set up in the future.

C. S. Layson, P.E.
Assistant State Highway Engineer
Administration and Research

cc: R. K. Capito
B. L. Wheat



1/2 EXIST. TANGENT SECTION

RECEIVED

MAY 14 1984

L. S. BLEVINS

MEMO TO: Russ Romine
Glen Kelly
George Asbury
Larry Blevins ✓

FROM: R. K. Capito *RKC*
State Highway Engineer

DATE: May 10, 1984

SUBJECT: Pavement Rehabilitation and Design Team

Attached is a copy of a letter that the Secretary received from the Federal Highway Administration pointing out that they have established a Pavement Rehabilitation and Design Team consisting of a member from their Pavement Branch and Construction and Maintenance Section. They are offering to provide assistance on an as-request basis for 4R pavement design-type projects.

I urge you to utilize the offer that has been made so we can eliminate future problems with the Federal Highway Administration at the time of PS & E submittal as we will have had their approval and input during development of these 4R projects.

Attachment

cc: Gene Drake
Harrison Evans

5/8/84 Capito, Kelly, Blevins, FHWA File



U.S. Department
of Transportation
Federal Highway
Administration

Kentucky Division Office

330 West Broadway
Frankfort, Kentucky 40601

10-10

IN REPLY REFER TO: HEC-KY

May 4, 1984

Dr. Floyd Poore, Secretary
Kentucky Transportation Cabinet
Frankfort, Kentucky

RECEIVED

MAY 07 1984

Dear Dr. Poore:

DEPARTMENT OF TRANSPORTATION

Subject: Pavement Rehabilitation and Design Team

The importance of properly engineered 4R pavement improvements becomes increasingly important due to the large share of available funds going into this type of work. Unfortunately, pavement 4R design remains more an art than an exact science as in many elements of highway engineering.

The field hearings being conducted by the Subcommittee on Investigations and Oversight, Committee on Public Works and Transportation, U.S. House of Representatives, has focused increased attention on the importance of well thought out and technically sound 4R pavement design decisions.

In order to assist FHWA field offices and States in evaluating and designing 4R projects in difficult and unusual situations, a pavement rehabilitation and design team has been assembled consisting of one member each from our Pavement Branch and our Construction and Maintenance Division to provide consulting service assistance on an "as requested" basis. You are urged to take advantage of this service in unusual conditions where the assistance is needed to evaluate alternatives and arrive at a proper 4R pavement design.

Please contact Mr. Paul Doss, Mr. Jim Hilborn or Mr. Dudley Brown of this office with requests for assistance. They will coordinate the assistance with the Washington Office team.

Sincerely yours,

For:

Robert E. Johnson
Division Administrator

FLOYD G. P. ORE
SECRETARY

COMMONWEALTH OF KENTUCKY
TRANSPORTATION CABINET
FRANKFORT, KENTUCKY 40622

MARTHA LAYNE COLLINS
GOVERNOR

DISTRICT ONE
Ky. Dam Road
P. O. Box 3010
Paducah, KY 42001

DISTRICT TWO
1840 North Main
Drawer D
Madison, Ky 42431

DISTRICT THREE
Morgantown Road
P. O. Box 599
Bowling Green, KY 42101

DISTRICT FOUR
East Dixie
P. O. Box 309
Elizabethtown, KY 42701

DISTRICT FIVE
977 Phillips Lane
P. O. Box 37090
Louisville, KY 40233

DISTRICT SIX
Buttermilk & 175
P. O. Box 17130
Covington, KY 41017

DISTRICT SEVEN
783 New Circle Rd. N.W.
P. O. Box 11127
Lexington, KY 40512

DISTRICT EIGHT
U. S. 27
P. O. Box 780
Somerset, KY 42501

DISTRICT NINE
Elizaville Road
P. O. Box 347
Flemingsburg, KY 41041

DISTRICT TEN
Highway 15
P. O. Box 521
Jackson, KY 41339

DISTRICT ELEVEN
Railroad Avenue
P. O. Box 250
Manchester, KY 40962

DISTRICT TWELVE
North Mayo Trail
P. O. Box 2488
Pikeville, KY 41501

MEMORANDUM

TO: Robert C. Deen, Director
Kentucky Transportation Research Program

FROM: John L. Puryear, P.E. *John L. Puryear*
Chief District Engineer
District One

DATE: January 18, 1984

SUBJECT: Data Collection for Jackson Purchase Parkway

In reply to your request for data concerning pavement layer thickness, crushed stone thickness, and sub-grade C.B.R. requirement for the Jackson Purchase Parkway MP 0.00 - MP 13.64, I am submitting the following.

The entire section you have asked for has the same structure which consists of 1½" Bituminous Surface, 5" Bituminous Base, 13" Cement Treated Bank Gravel. The minimum CBR requirement was 6.

JLP:sld

